US009367029B1

(12) **United States Patent**
Blair et al.

(10) **Patent No.: US 9,367,029 B1**
(45) **Date of Patent: Jun. 14, 2016**

(54) **RESETTABLE SEPARATOR FOR ELECTROPHOTOGRAPHIC COMPONENTS**

(71) Applicant: **LEXMARK INTERNATIONAL, INC.**, Lexington, KY (US)

(72) Inventors: **Brian Allen Blair**, Richmond, KY (US); **Derek Masami Inouye**, Lexington, KY (US); **Brian Reed Spencer**, Lexington, KY (US); **Gary Michael Tylicki**, Georgetown, KY (US)

(73) Assignee: **Lexmark International, Inc.**, Lexington, KY (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **14/938,999**

(22) Filed: **Nov. 12, 2015**

(51) **Int. Cl.**
G03G 21/16 (2006.01)

(52) **U.S. Cl.**
CPC ***G03G 21/1676*** (2013.01)

(58) **Field of Classification Search**
None
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2012/0183321 A1* 7/2012 Mori G03G 1/1633 399/110

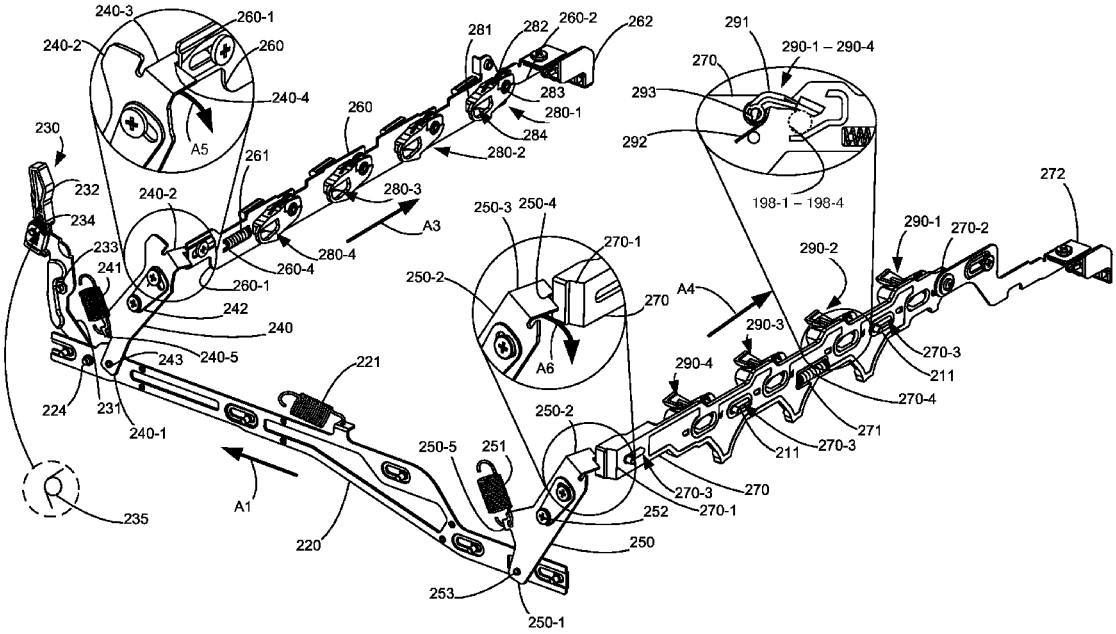
* cited by examiner

Primary Examiner — Clayton E LaBalle
Assistant Examiner — Jas Sanghera
(74) *Attorney, Agent, or Firm* — John Victor Pezdek

(57) **ABSTRACT**

A reusable and resettable separator for use with electrophotographic components of an imaging device. The separator is installed with the imaging device and includes a spring-biased lift rail and release linkage and is used to move either a developer unit or a photoconductive drum unit between an operative position where a developer roll and a photoconductive drum form a contact nip and a separated position where the two rolls are separated. The separator is initially set using the lift rail to place two rolls in the separated position with the release linkage engaging the lift rail to hold this position. Opening of an access door engages a one-way release arm actuating the release linkage allowing the lift rail to translate moving the two rolls to the operative position. When reshipment of the imaging device is needed, the separator can manually reset placing the two rolls back in the separated position.

19 Claims, 16 Drawing Sheets



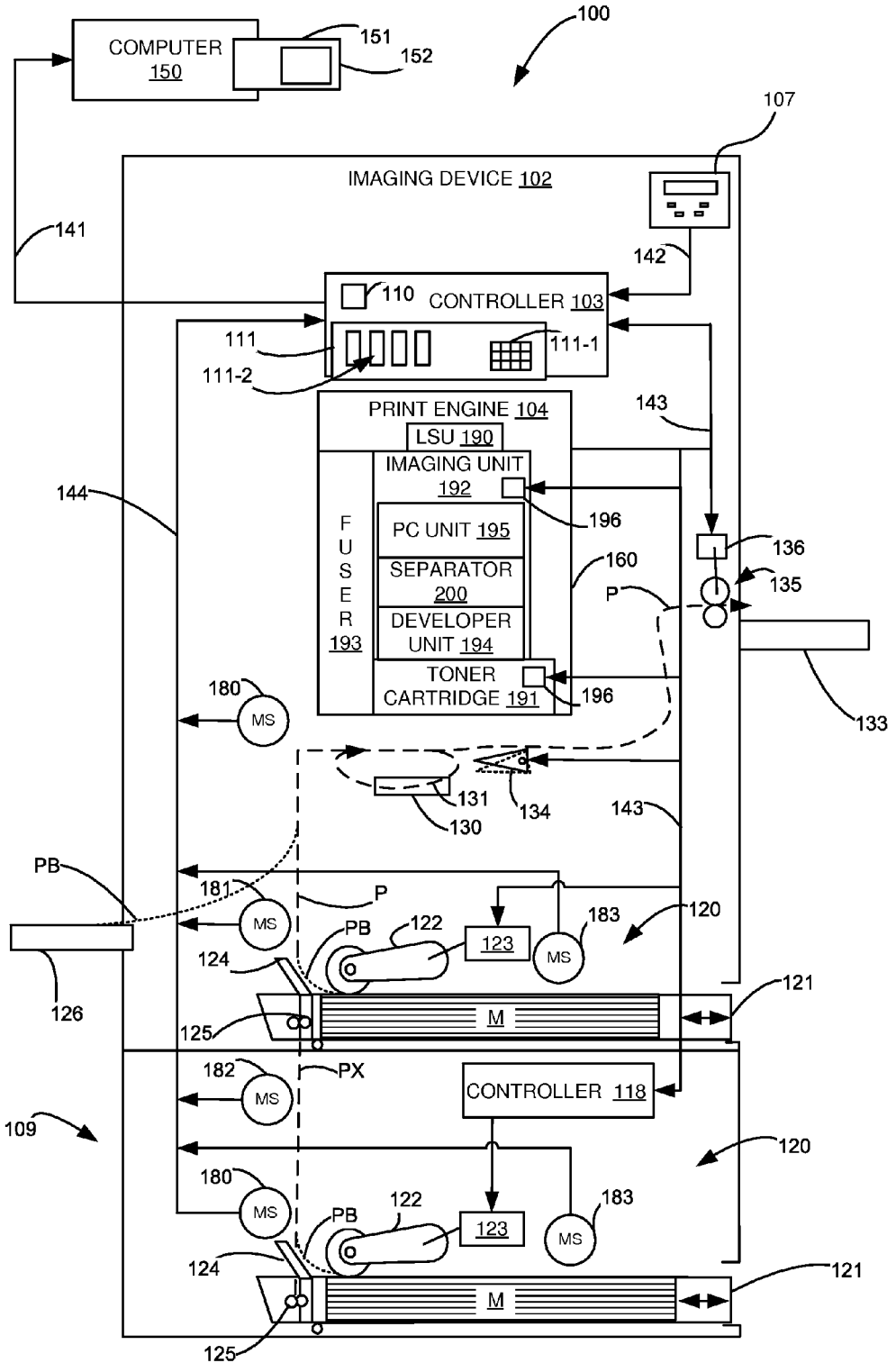

100
COMPUTER 150
151
152
107
IMAGING DEVICE 102
141
142
110
CONTROLLER 103
111
111-1
111-2
PRINT ENGINE 104
143
LSU 190
IMAGING UNIT 192
144
196
PC UNIT 195
136
160
SEPARATOR 200
135
P
FUSER 193
DEVELOPER UNIT 194
TONER CARTRIDGE 191
196
180
MS
133
131
134
130
143
PB
181
P
MS
PB
122
123
MS
183
120
124
121
126
125
M
182
PX
MS
CONTROLLER 118
109
120
180
MS
PB
122
123
MS
183
124
121
M
125

Figure 1

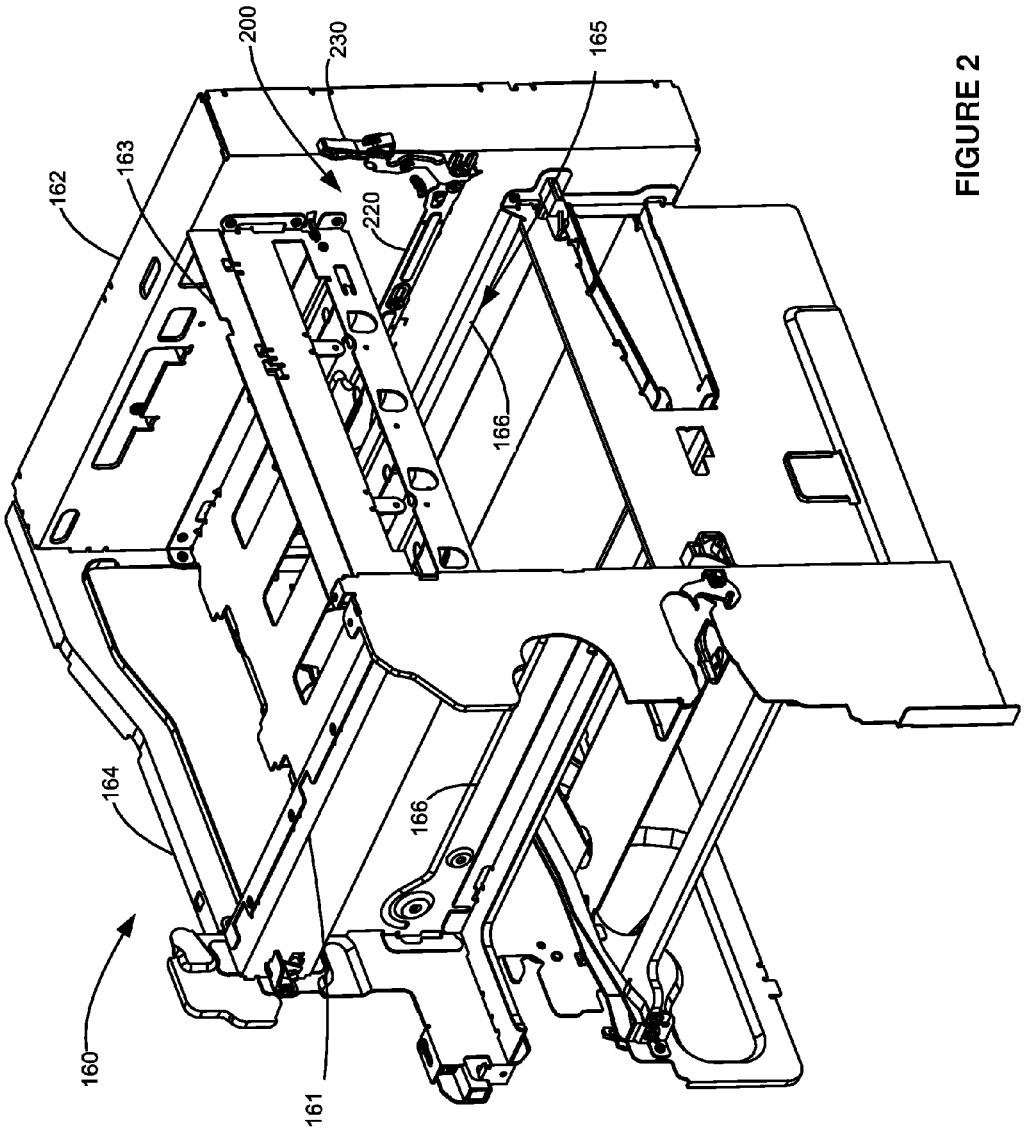


FIGURE 2

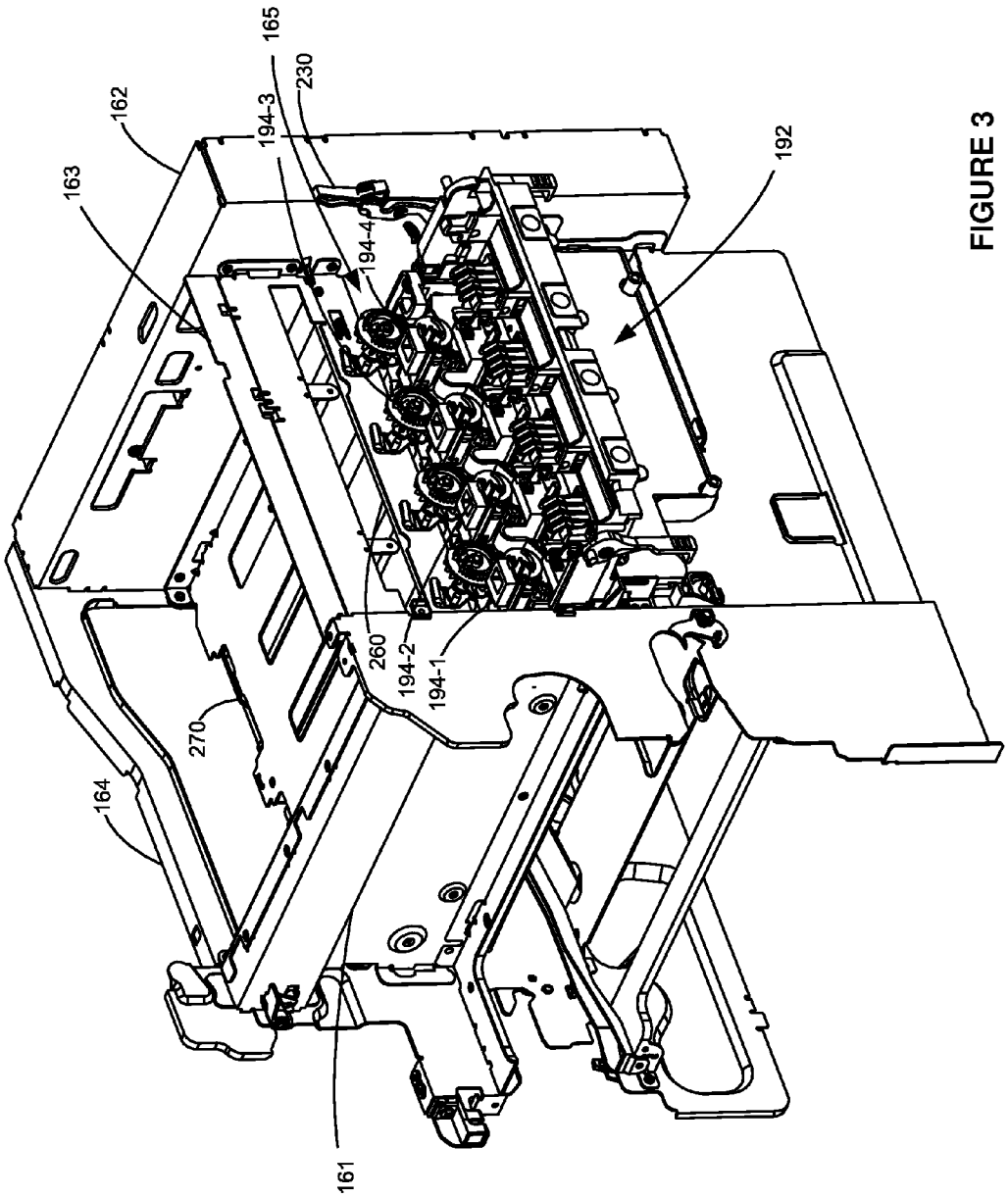


FIGURE 3

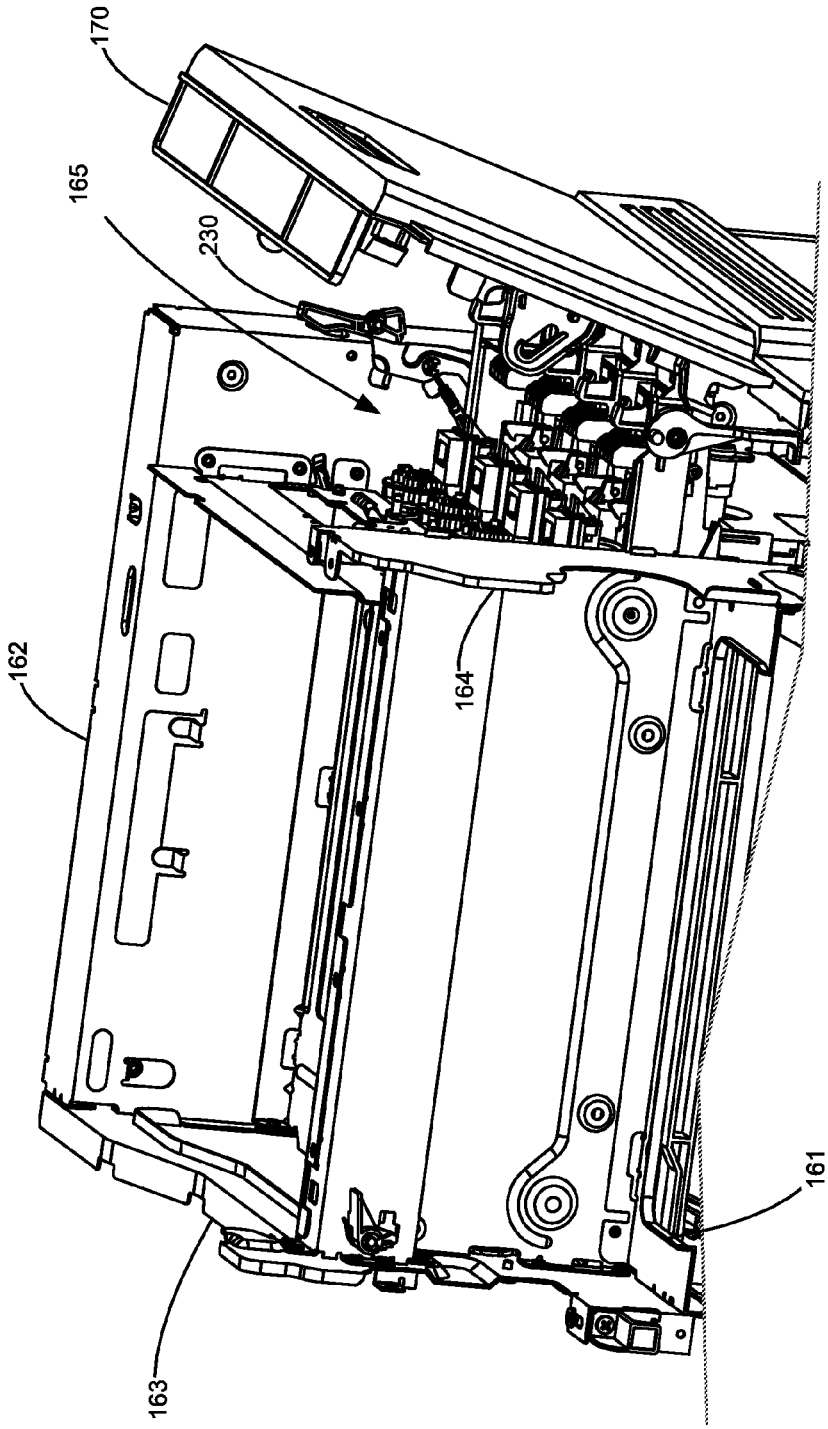


FIGURE 4

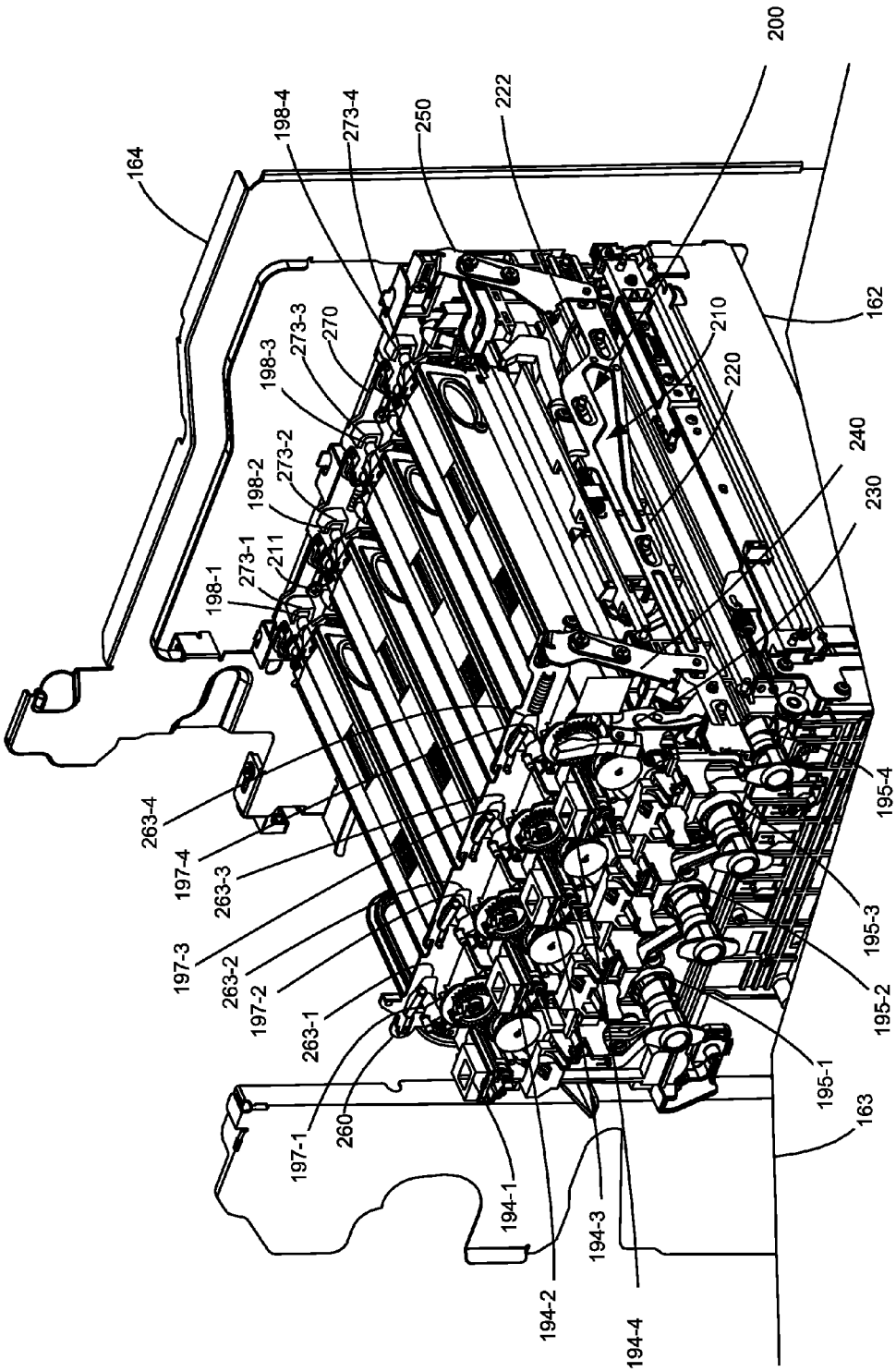

200
198-4
273-4
250
222
164
162
210
273-3
270
198-3
220
273-2
198-2
240
230
211
273-1
198-1
195-4
263-4
197-4
263-3
195-3
197-3
263-2
195-2
197-2
263-1
195-1
260
163
197-1
194-1
194-3
194-2
194-4

FIGURE 5

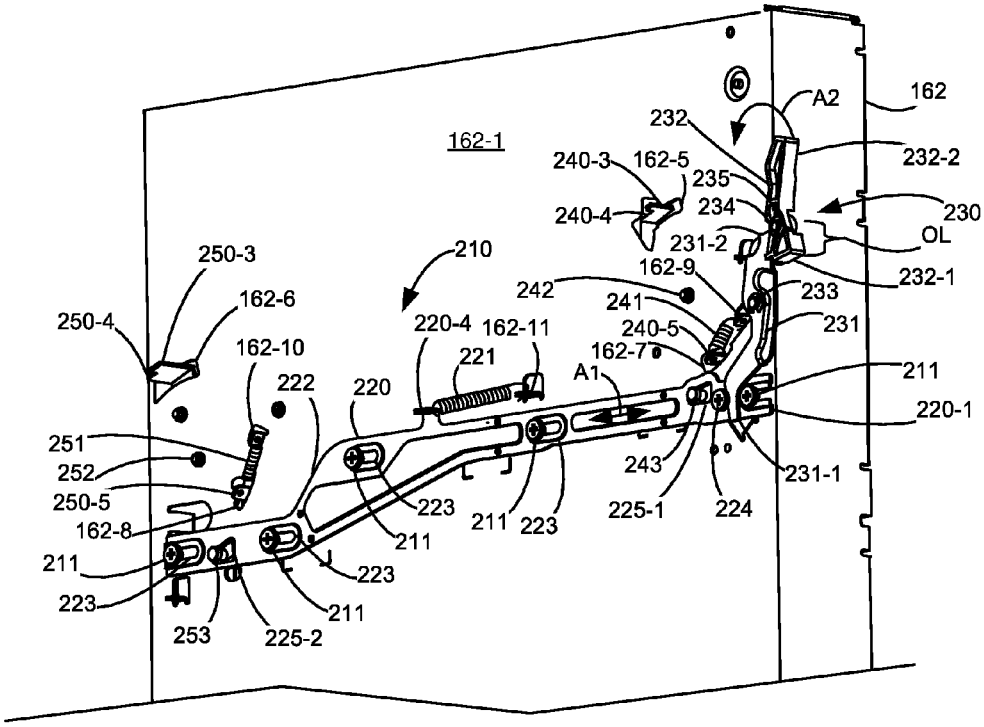


FIGURE 6

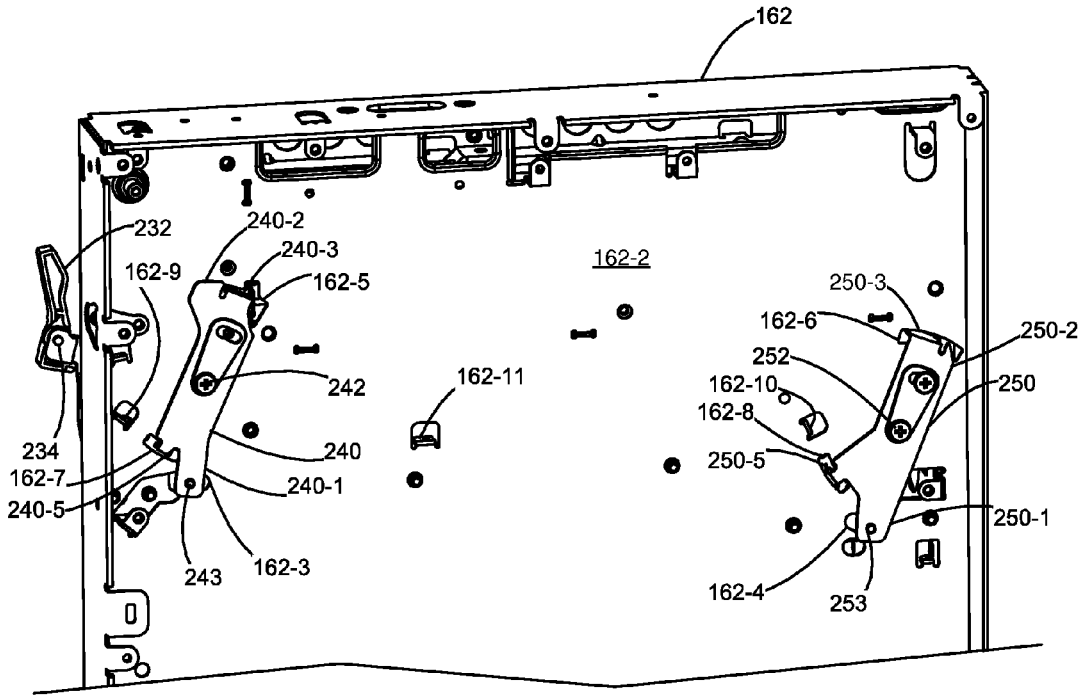


FIGURE 7

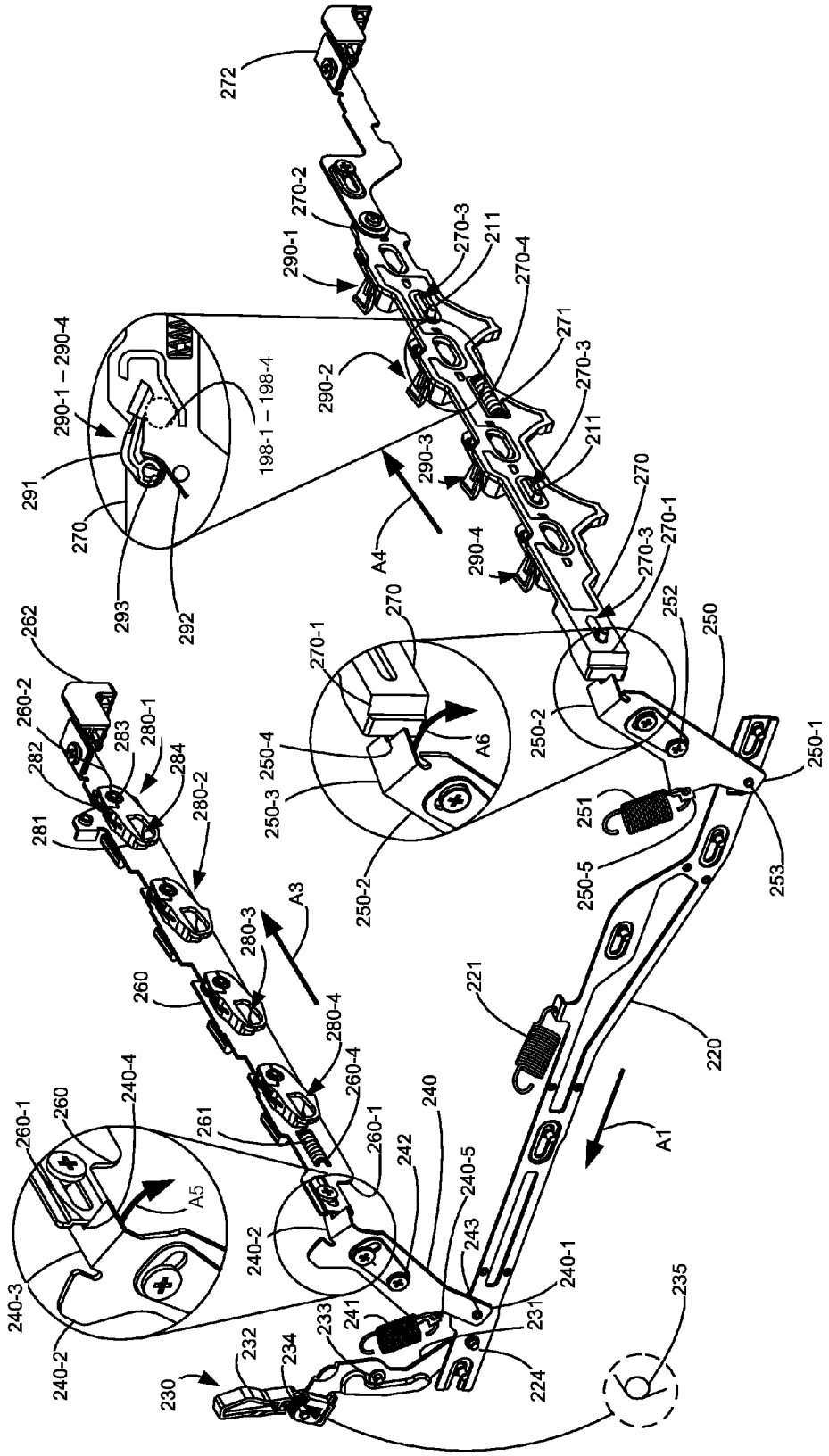

272
270-2
290-1
270-3
211
270-4
271
290-2
290-3
290-4
270-1
270
252
250
250-1
253
251
250-5
250-2
250-3
250-4
A6
A4
290-1 – 290-4
198-1 – 198-4
291
270
293
292
262
260-2
282
283
280-1
284
280-2
281
280-3
A3
260
280-4
260-4
260-1
240-4
261
240
242
240-5
243
240-1
240-2
240-3
A5
241
233
232
234
230
231
224
235
221
220
A1

FIGURE 8

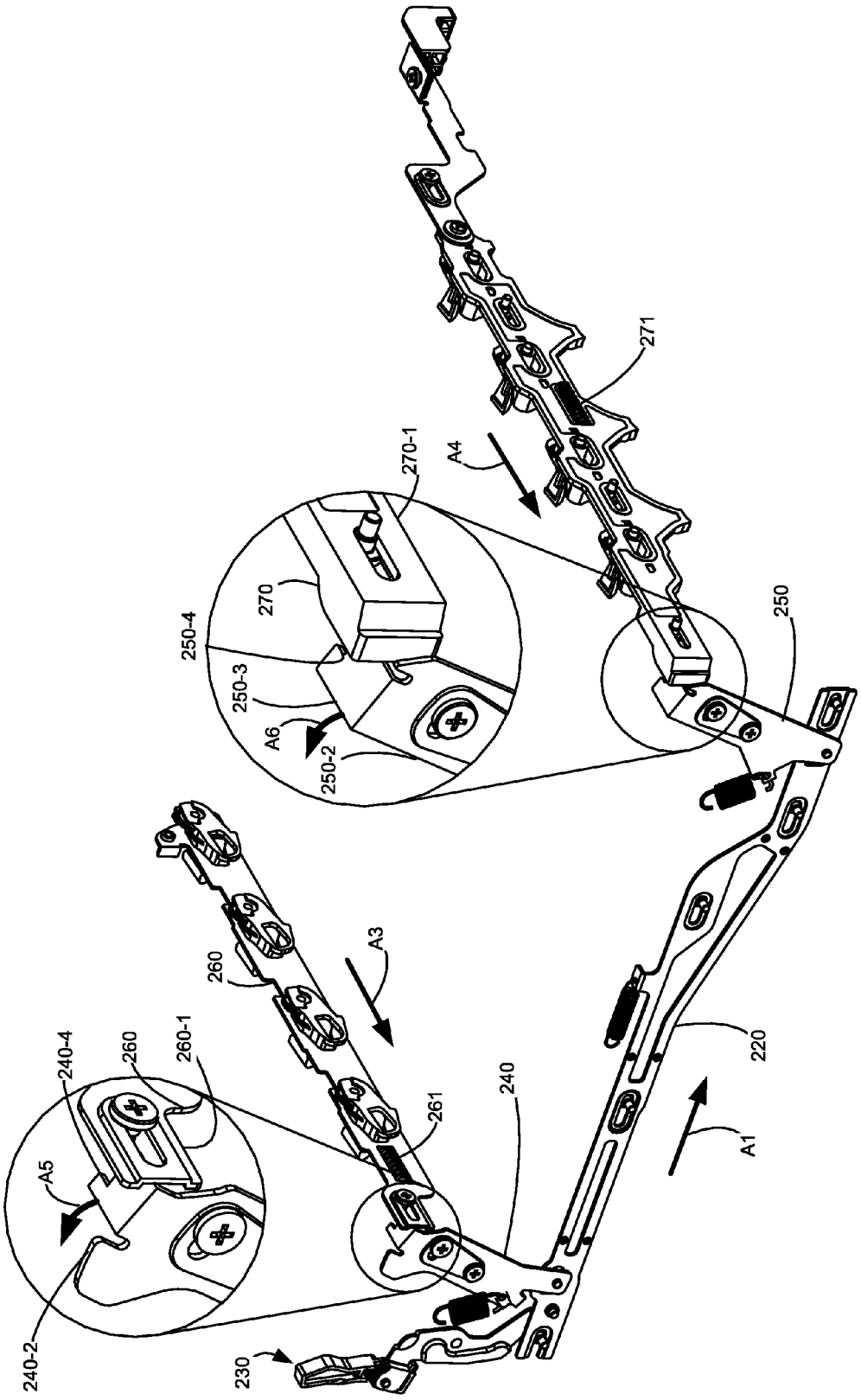

271
270-1
A4
270
250-4
250-3
A6
250-2
250
260
A3
260-1
240-4
240
261
A5
240-2
230
220
A1

FIGURE 9

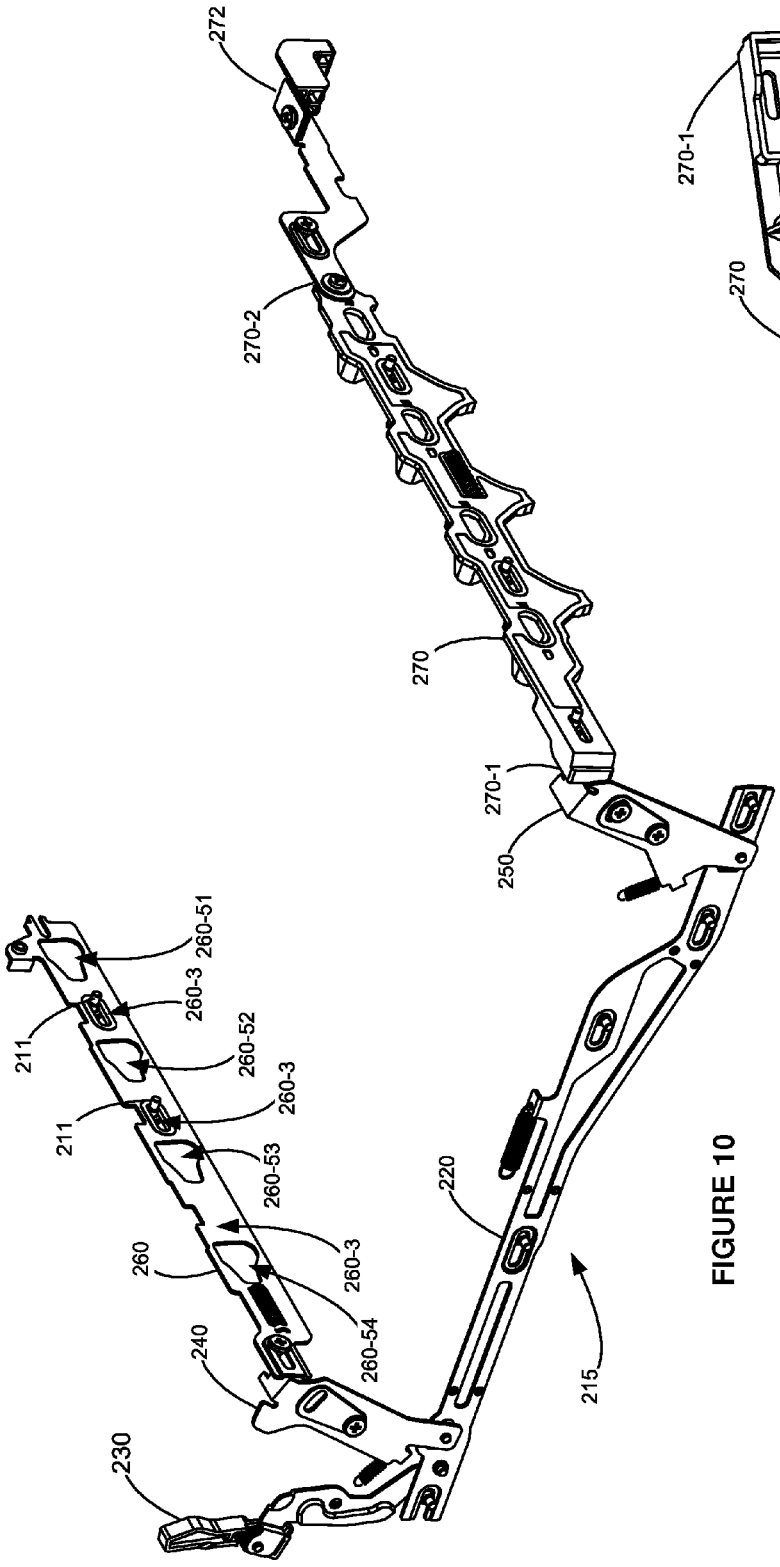


FIGURE 10

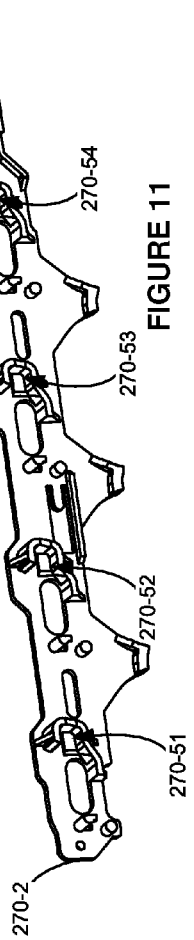


FIGURE 11

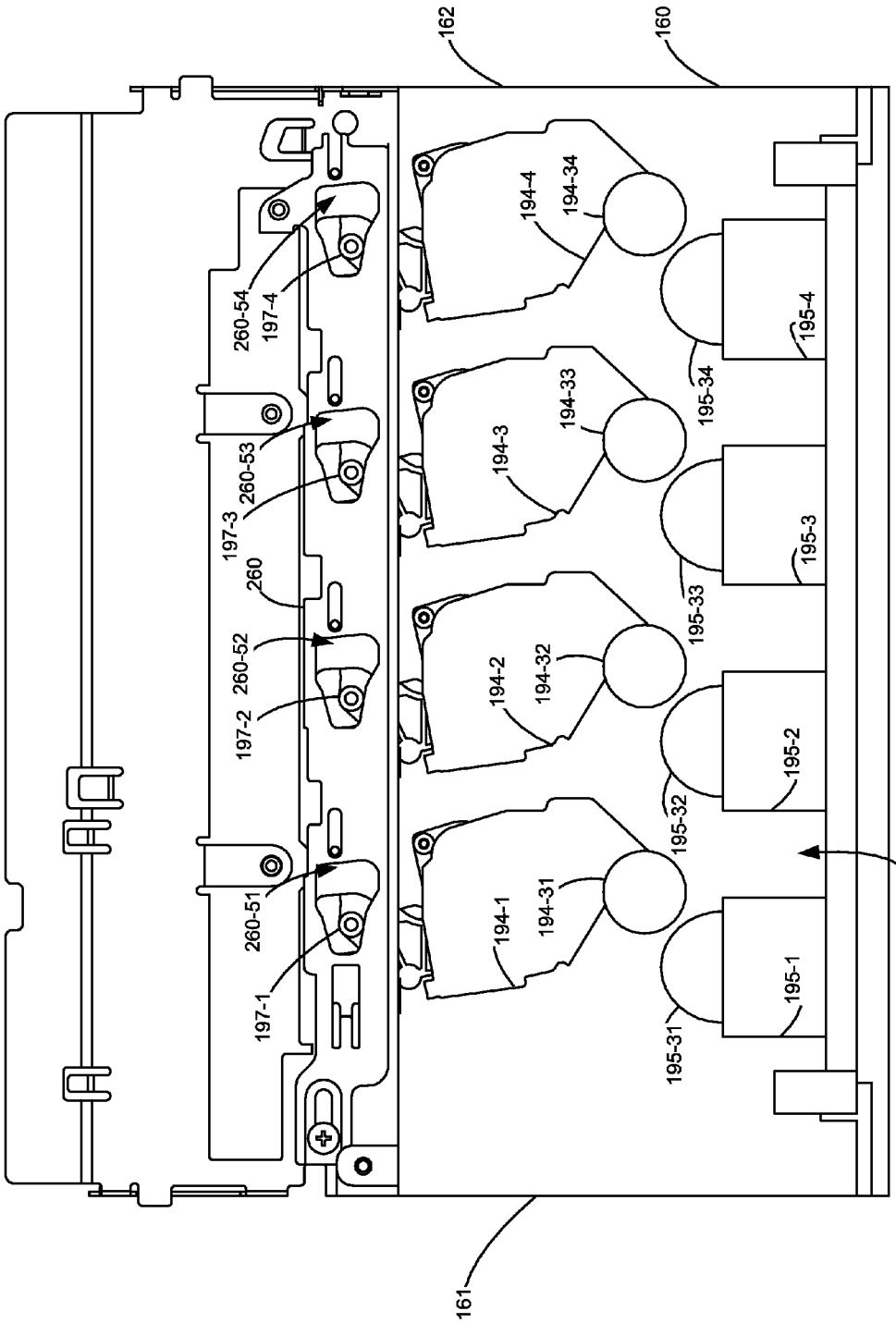

162
160
194-4
194-34
260-54
197-4
195-4
195-34
194-3
194-33
260-53
197-3
195-3
260
195-33
194-2
194-32
260-52
197-2
195-2
195-32
192
194-1
194-31
260-51
197-1
195-1
195-31
161

FIGURE12

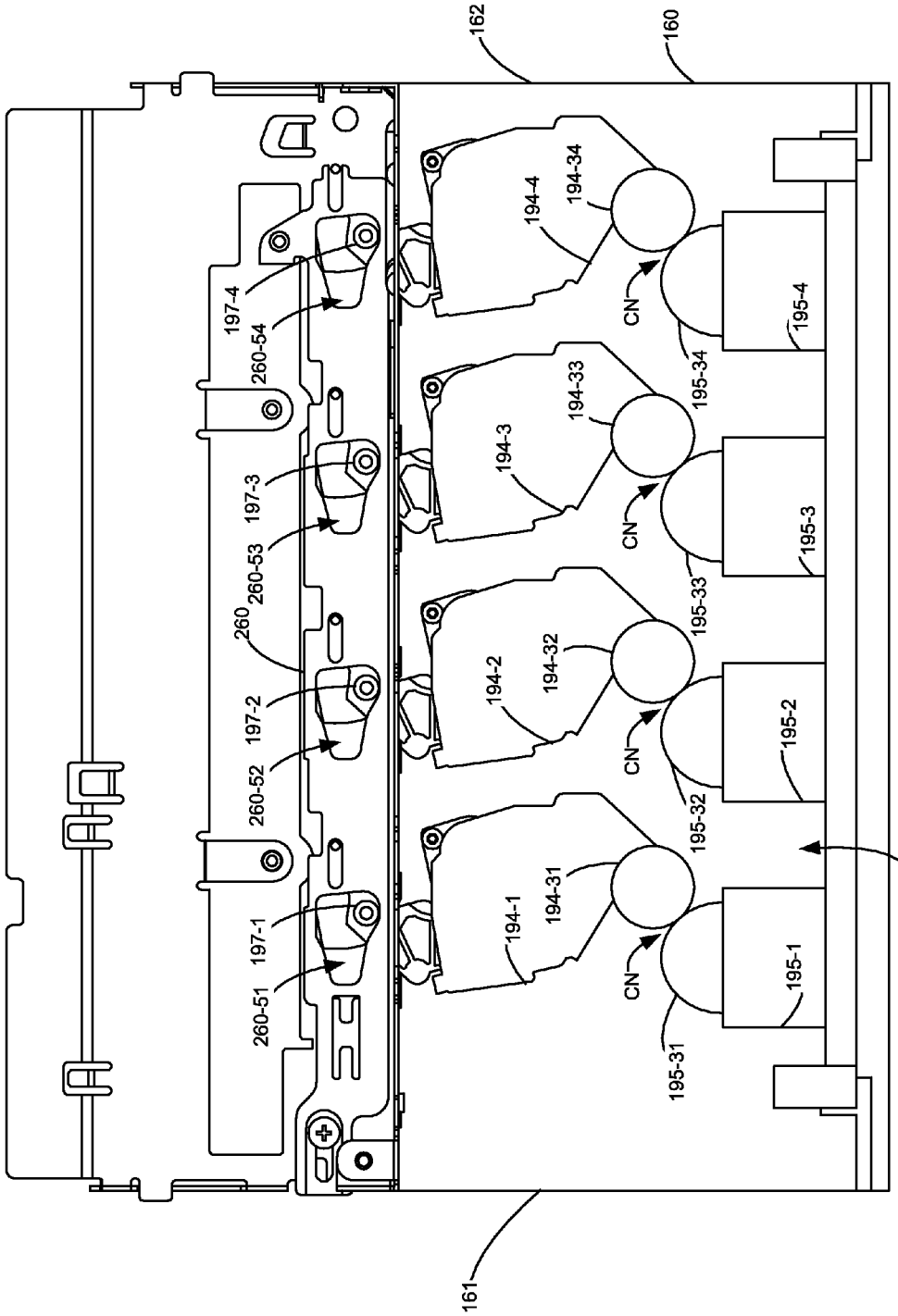

162
160
161
192
194-4
194-34
194-3
194-33
194-2
194-32
194-1
194-31
195-4
195-34
195-3
195-33
195-2
195-32
195-1
195-31
CN
197-4
260-54
197-3
260-53
260
197-2
260-52
197-1
260-51

FIGURE 13

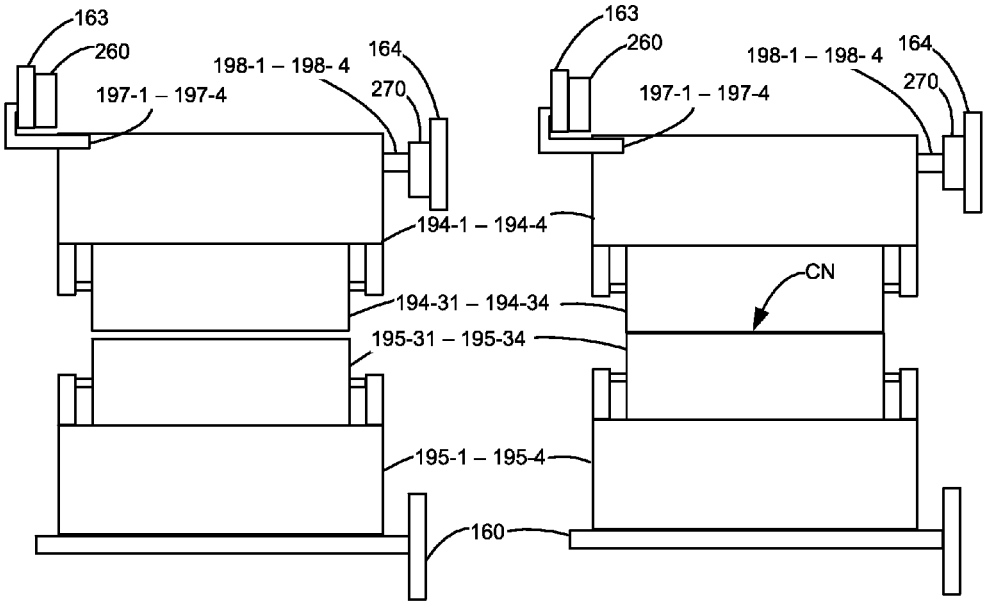


Figure 14

Figure15

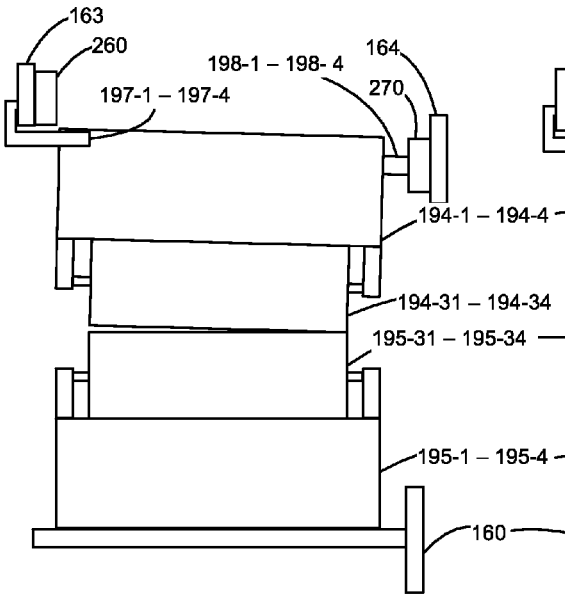


Figure 16

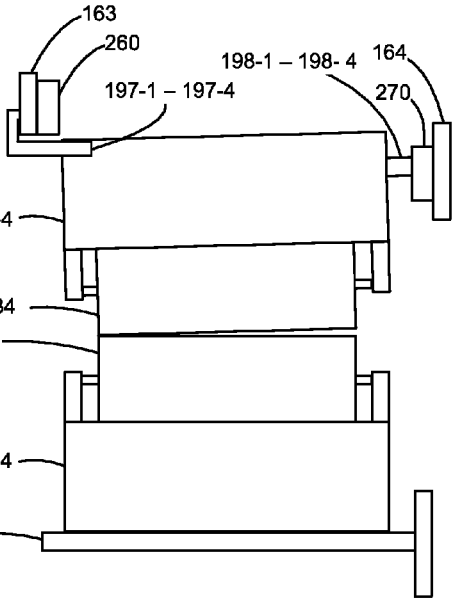


Figure 17

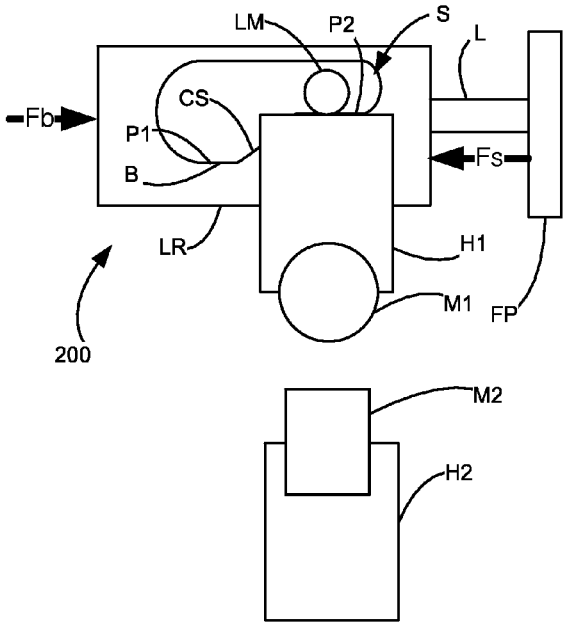


Figure 18

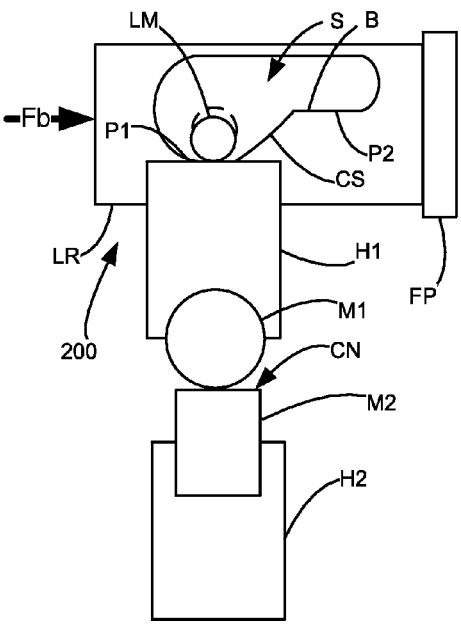


Figure 19

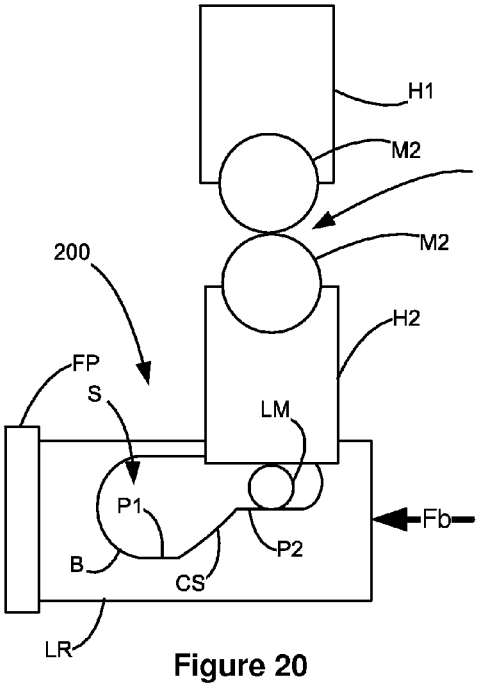


Figure 20

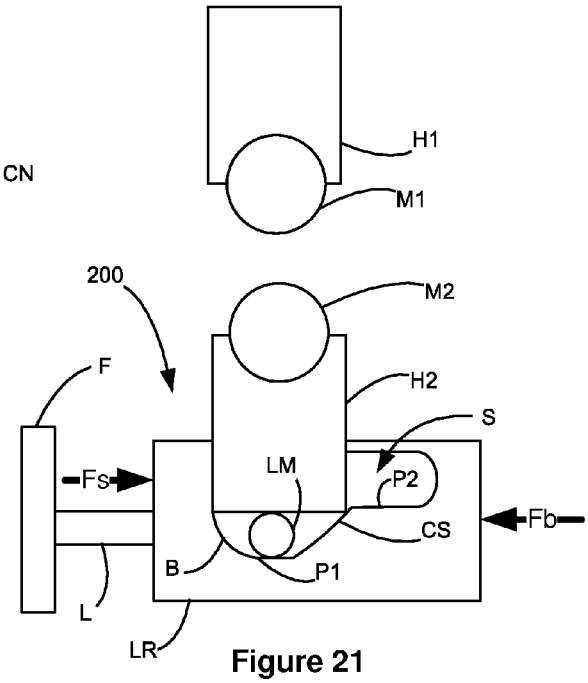


Figure 21

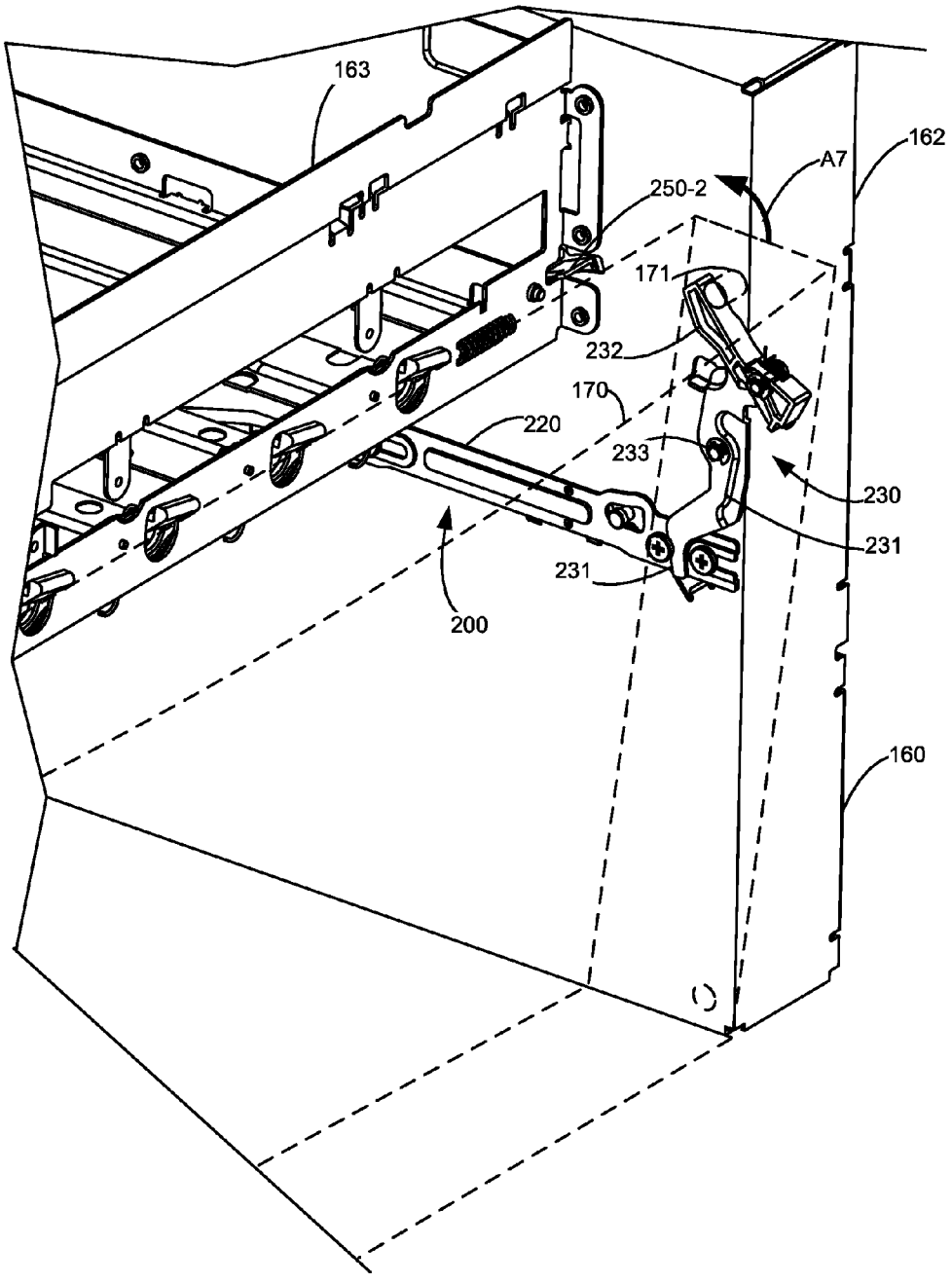


FIGURE 22

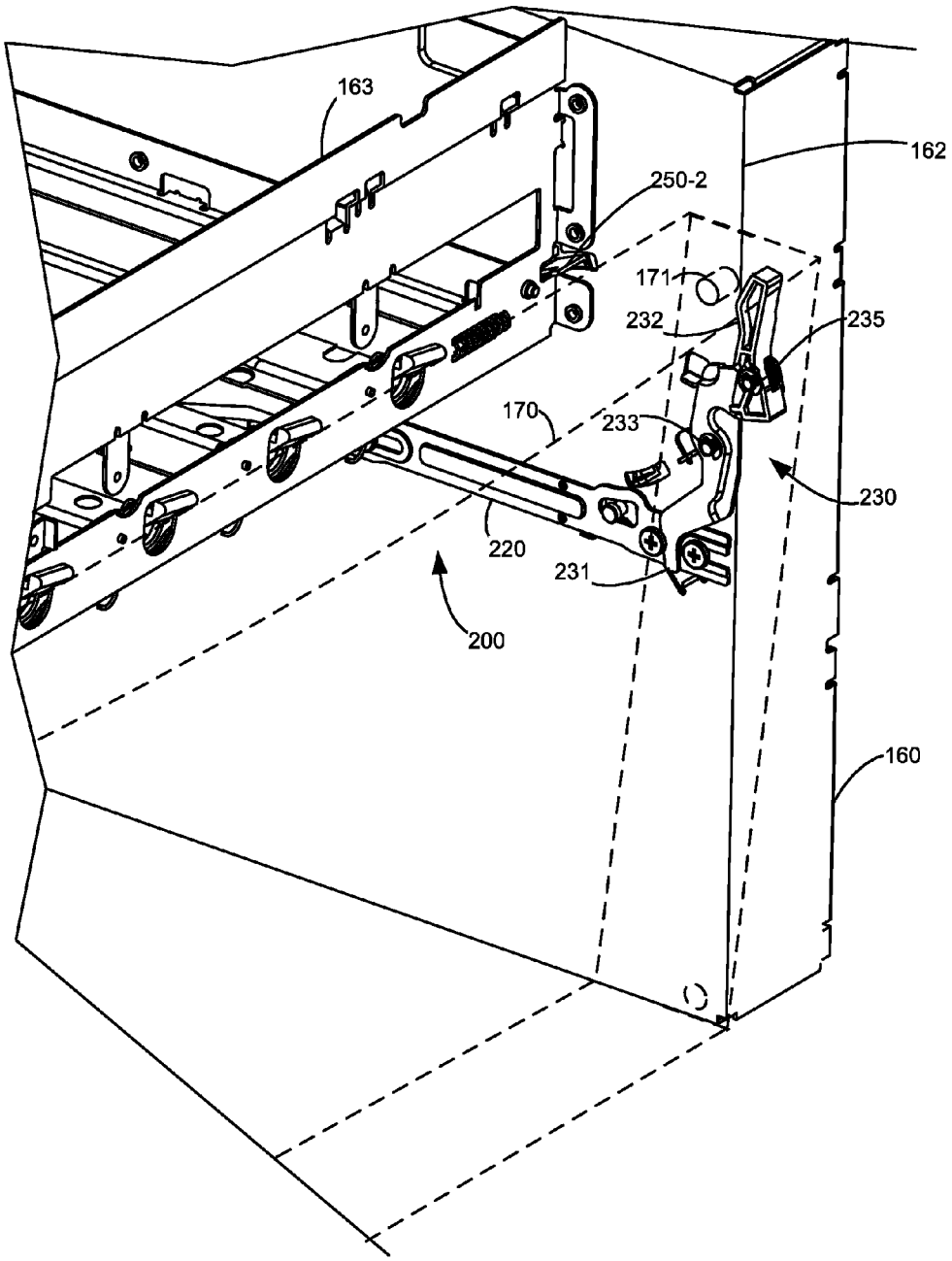


FIGURE 23

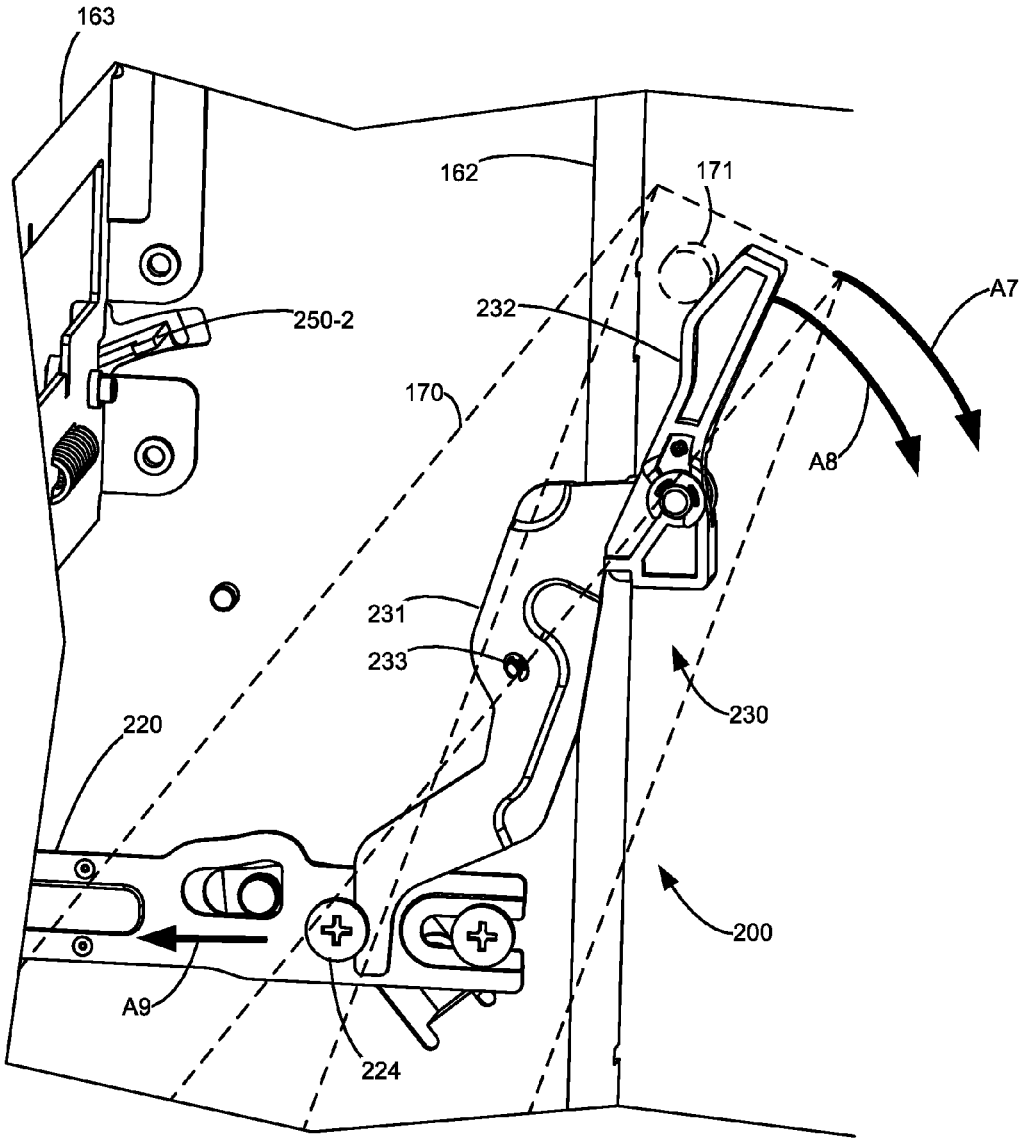


FIGURE 24

RESETTABLE SEPARATOR FOR ELECTROPHOTOGRAPHIC COMPONENTS

CROSS REFERENCES TO RELATED APPLICATIONS

None.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

None.

REFERENCE TO SEQUENTIAL LISTING, ETC.

None.

BACKGROUND

1. Field of the Disclosure

The present disclosure relates generally to imaging devices, and more particularly to devices used to separate developer units from photoconductive drums in an imaging device.

2. Description of the Related Art

For an electro-photographic printer that utilizes a contact nip between photoconductor (PC) drum and developer rolls in an electrophotographic imaging device to produce a toned image onto media, it is a common practice to physically separate contact interfaces during packaging and shipping of the printer. This separation helps to prevent out-of-box delivery failures to the imaging system components, such as developer roll compression set and cold toner fusion roll defects. For a monochrome imaging device there is typically one PC drum-developer roll contact nip. For a color imaging device, there are four such contact nips—one each for yellow, cyan, magenta, and black.

To ameliorate these concerns, in the prior art, a separator mechanism for spacing the PC drum from the developer roll was inserted prior to packaging and shipping of the imaging device. While automatic control of this separating mechanism is possible, it is generally considered too cost-prohibitive, and/or requires too much additional space within the imaging device housing. Therefore, prior art embodiments have used disposable packaging materials to hold the PC drum developer roll interface in its separated state during shipping. These materials are then removed during initial un-boxing and set-up of the imaging device by the end user to allow contact between the PC drum and developer roll. However, such embodiments do have the drawback of requiring the end user to perform this set-up operation, as opposed to the benefit of having the action being automatic and transparent to the end user. There is also the added concern regarding the status of these imaging components should the printer need to be re-packaged and reshipped after the initial set-up. For example, imaging devices may be centrally configured in bulk by a given customer, such as a pharmacy chain or bank, and then later be re-distributed to various locations.

Ideally, when reshipping is needed, the contact nip is re-separated to help prevent roll defects. However, there is a question of how the separation is to be achieved should the packaging materials have been disposed of or are unavailable. It would be an improvement over the prior art if the separating mechanism remained with the imaging device and could be reset should reshipping be needed. It would be advantageous if resetting could be done without having to rely on reinserting removable and possibly disposable packaging materials or require the use of special tools. It would be further advantageous to be able to place the PC drum and developer roll into contact when the system is to be ready for printing without additional user actions.

SUMMARY

Disclosed is a reusable and resettable separator for use with electrophotographic components of an imaging device. The separator is installed in the imaging device and includes a spring-biased lift rail and a release linkage and is used to move either a developer unit or a photoconductive drum unit between an operative position where a developer roll and a photoconductive drum form a contact nip and a separated position where the two rolls are separated. Prior to initial shipment to a customer, the separator is initially set by translating the lift rail so that the two rolls are in the separated position and the release linkage engages with the lift rail to maintain its position. Opening of an access door during initial installation of toner cartridges for the imaging device, the access door engages a one-way release arm translating the release linkage releasing the lift rail allowing the two rolls to move into the operative position. Where reshipment of the imaging device is needed, the separator may be reused by being manually reset by translating the lift rail away from the release linkage allowing the release linkage to reengage with the lift rail so that the two rolls are placed in the separated position.

BRIEF DESCRIPTION OF THE DRAWINGS

The above-mentioned and other features and advantages of the disclosed embodiments, and the manner of attaining them, will become more apparent and will be better understood by reference to the following description of the disclosed embodiments in conjunction with the accompanying drawings.

FIG. **1** is a schematic illustration of an imaging device and finisher with a media accumulator-ejector of the present disclosure.

FIG. **2** is a perspective illustration of an example frame for an imaging device having an example separator of the present disclosure mounted thereon.

FIG. **3** is a perspective illustration of the frame of FIG. **2** having an imaging unit installed with the imaging unit having respective pluralities of developer units and PC units.

FIG. **4** is a partial perspective illustration of the frame of FIG. **2** showing an access door into the imaging unit.

FIG. **5** is a partial perspective illustration of FIG. **3** with portions of the frame removed to show the components of the example separator of the present invention shown in FIG. **2** in relation to the imaging unit and its components.

FIGS. **6-7** are partial perspective illustrations of the respective interior and exterior of a rear panel of the frame of FIG. **2** showing the mounting of a release linkage of the example separator of the present invention where FIG. **6** shows an interior view and FIG. **7** shows the exterior view of the rear panel.

FIGS. **8-9** are perspective illustrations of the example separator of the present invention shown in an engaged position and a released position, respectively.

FIG. **10** is a perspective view of an alternative example separator of the present invention shown in a released position.

FIG. **11** is a perspective view of one of the lift rails used in the separator showing an example of open lift slots.

FIGS. **12-13** are elevational illustrations respectively showing the developer units in a lifted or separated position and in the operative position with respect to their corresponding PC units contained within the imaging basket where the developer and PC units and imaging basket are schematically depicted.

FIGS. **14-17** are schematic illustrations showing operative and separated positions of a developer unit and its corresponding PC unit where FIG. **14** shows complete separation of the respective units, FIG. **15** shows the operative positions of the respective units, FIG. **16** shows a first angled separation where the contact occurs adjacent to the right ends of the respective units, and, FIG. **17** shows a second angled separation where contact occurs adjacent to the left ends of the respective units.

FIGS. **18-19** schematically illustrate the lift slots provided in the lift rails of the separator and respective separation and engagement of two generic electrophotographic units within an imaging device where the separator is used to move the upper unit.

FIGS. **20-21** schematically illustrate the respective separation and engagement of two generic electrographic units within an imaging device where the separator is used to move on the lower unit.

FIGS. **22-24** illustrate the operation of a one-way release lever for the example separator of the present disclosure wherein FIG. **22** illustrates the developer and PC units in a separated position, the separator in an engaged position and the closing of an access door where an actuation post folds the release lever leaving the developer and PC units in their separated position; FIG. **23** shows the access door in the closed position, and, FIG. **24** shows the release lever being engaged by an actuation post on the access door during opening of the access door which rotates the release lever to place the separator in a released position moving the developer and PC units into the operative position.

DETAILED DESCRIPTION

It is to be understood that the present disclosure is not limited in its application to the details of construction and the arrangement of components set forth in the following description or illustrated in the drawings. The present disclosure is capable of other embodiments and of being practiced or of being carried out in various ways. Also, it is to be understood that the phraseology and terminology used herein is for the purpose of description and should not be regarded as limiting. As used herein, the terms "having", "containing", "including", "comprising", and the like are open ended terms that indicate the presence of stated elements or features, but do not preclude additional elements or features. The articles "a", "an" and "the" are intended to include the plural as well as the singular, unless the context clearly indicates otherwise. The use of "including", "comprising", or "having" and variations thereof herein is meant to encompass the items listed thereafter and equivalents thereof as well as additional items. Terms such as "about" and the like are used to describe various characteristics of an object, and such terms have their ordinary and customary meaning to persons of ordinary skill in the pertinent art.

Terms such as "about" and the like have a contextual meaning and are used to describe various characteristics of an object, and such terms have their ordinary and customary meaning to persons of ordinary skill in the pertinent art. Terms such as "about" and the like, in a first context mean "approximately" to an extent as understood by persons of ordinary skill in the pertinent art; and, in a second context, are used to describe various characteristics of an object, and in such second context mean "within a small percentage of" as understood by persons of ordinary skill in the pertinent art.

Unless limited otherwise, the terms "connected", "coupled", and "mounted", and variations thereof herein are used broadly and encompass direct and indirect connections, couplings, and mountings. In addition, the terms "connected" and "coupled" and variations thereof are not restricted to physical or mechanical connections or couplings. Spatially relative terms such as "left", "right", "top", "bottom", "front", "back", "rear", "side", "under", "below", "lower", "over", "upper", and the like, are used for ease of description to explain the positioning of one element relative to a second element. These terms are intended to encompass different orientations of the device in addition to different orientations than those depicted in the figures. Further, terms such as "first", "second", and the like, are also used to describe various elements, regions, sections, etc. and are also not intended to be limiting. Like terms refer to like elements throughout the description.

In addition, it should be understood that embodiments of the present disclosure include both hardware and electronic components or modules that, for purposes of discussion, may be illustrated and described as if the majority of the components were implemented solely in hardware. However, one of ordinary skill in the art, and based on a reading of this detailed description, would recognize that, in at least one embodiment, the electronic based aspects of the invention may be implemented in software. As such, it should be noted that a plurality of hardware and software-based devices, as well as a plurality of different structural components may be utilized to implement the invention. Furthermore, and as described in subsequent paragraphs, the specific mechanical configurations illustrated in the drawings are intended to exemplify embodiments of the present disclosure and that other alternative mechanical configurations are possible.

The term "image" as used herein encompasses any printed or electronic form of text, graphics, or a combination thereof. "Media" or "media sheet" refers to a material that receives a printed image or, with a document to be scanned, a material containing a printed image. The media is said to move along a media path, a media branch, and a media path extension from an upstream location to a downstream location as it moves from the media trays to the output area of the imaging system. For a top feed option tray, the top of the option tray is downstream from the bottom of the option tray. Conversely, for a bottom feed option tray, the top of the option tray is upstream from the bottom of the option tray. As used herein, the leading edge of the media is that edge which first enters the media path and the trailing edge of the media is that edge that last enters the media path. Depending on the orientation of the media in a media tray, the leading/trailing edges may be the short edge of the media or the long edge of the media, in that most media is rectangular. As used herein, the term "media width" refers to the dimension of the media that is transverse to the direction of the media path. The term "media length" refers to the dimension of the media that is aligned to the direction of the media path. "Media process direction" describes the movement of media within the imaging system, and is generally means from an input toward an output of the imaging system. Further, relative positional terms may be used herein. For example, "superior" means that an element is above another element. Conversely "inferior" means that an element is below or beneath another element

Media is conveyed using pairs of aligned rolls forming feed nips. The term "nip" is used in the conventional sense to refer to the opening formed between two rolls that are located at

about the same point in the media path. The rolls forming the nip may be separated apart, be tangent to each other, or form an interference fit with one another. With these nip types, the axes of the rolls are parallel to one another and are typically, but do not have to be, transverse to the media path. For example, a deskewing nip may be at an acute angle with respect to the media feed path. The term "separated nip" refers to a nip formed between two rolls that are located at different points along the media path and have no common point of tangency with the media path. Again, the axes of rotation of the rolls having a separated nip are parallel but are offset from one another along the media path. Nip gap refers to the space between two rolls. Nip gaps may be positive, where there is an opening between the two rolls, zero, where the two rolls are tangentially touching, or negative, where there is an interference fit between the two rolls.

As used herein, the term "communication link" is used to generally refer to a structure that facilitates electronic communication among components. While several communication links are shown, it is understood that a single communication link may serve the same functions as the multiple communication links that are illustrated. Accordingly, a communication link may be a direct electrical wired connection, a direct wireless connection (e.g., infrared or r.f.), or a network connection (wired or wireless), such as for example, an Ethernet local area network (LAN) or a wireless networking standard, such as IEEE 802.11. Devices interconnected by a communication link may use a standard communication protocol, such as for example, universal serial bus (USB), Ethernet or IEEE 802.xx, or other communication protocols. The terms "input" and "output" when applied to a sensor, circuit or other electronic device means an electrical signal that is produced by or is acted upon by such sensor, circuit or electronic device. Such electrical signals may be analog or digital signals.

Referring now to the drawings and particularly to FIG. **1**, there is shown a diagrammatic depiction of an example imaging system **100**. As shown, imaging system **100** may include an imaging device **102** and an optional computer **150** attached to the imaging device **102**. Imaging device **102** is shown as an electrophotographic printer that includes a controller **103**, a print engine **104**, a user interface **107**, an option assembly **109** and a separator **200**.

Controller **103** includes a processor unit **110** and associated memory **111**, and may be formed as one or more Application Specific Integrated Circuits (ASICs). Memory **111** may be any volatile or non-volatile memory or combination thereof such as, for example, random access memory (RAM), read only memory (ROM), flash memory and/or non-volatile RAM (NVRAM). Alternatively, memory **111** may be in the form of a separate electronic memory (e.g., RAM, ROM, and/or NVRAM), a hard drive, a CD or DVD drive, or any memory device convenient for use with controller **103**. Provided in memory **111** is one or more look-up tables **111-1** and/or firmware modules **111-2** used for control of imaging device **102** and its attachments such as option assembly **109**.

In FIG. **1**, controller **103** is illustrated as being communicatively coupled with computer **150** via communication link **141** and with user interface **107** via communication link **142**. Computer **150** includes in its memory **151** a software program including program instructions that function as an imaging driver **152**, e.g., printer/scanner driver software, for imaging device **102**. Imaging driver **152** facilitates communication between imaging device **102** and computer **150**. One aspect of imaging driver **152** may be, for example, to provide formatted print data to imaging device **102**, and, more particularly, to print engine **104**, to print an image. In some circumstances, it may be desirable to operate imaging device **102** in a standalone mode. In the standalone mode, imaging device **102** is capable of functioning without computer **150**. Accordingly, all or a portion of imaging driver **152**, or a similar driver, may be located in a firmware modules **111-2** within controller **103** of imaging device **102** so as to accommodate printing functionality when operating in the standalone mode. Controller **103** may provide computer **150** and/or to user interface **107** with status indications and messages regarding the media, including media to be printed, imaging device **102** itself or any of its subsystems, consumables status, etc. Computer **150** may provide operating commands to imaging device **102**. Computer **150** may be located nearby imaging device **102** or be remotely connected to imaging device **102** via an internal or external computer network. Imaging device **102** may also be communicatively coupled to other imaging devices.

Controller **103** is illustrated as being communicatively coupled with print engine **104** via communication link **143**. Print engine **104** and user interface **107** may be controlled by firmware modules **111-2**, maintained in memory **111**, and performed by controller **103** or another processing element. Controller **103** serves to process print data, operate print engine **104** and toner cartridge **191** during printing, and move media through imaging device **102**.

Print engine **104** is illustrated as including a laser scan unit (LSU) **190**, a toner cartridge **191**, an imaging unit **192**, and a fuser **193**, all mounted within a frame **160** of imaging device **102**. Imaging unit **192** and toner cartridge **191** are supported in their operating positions with the frame **160** of imaging device **102** so that toner cartridge **191** is operatively mated to imaging unit **192** while minimizing any unbalanced loading forces applied by the toner cartridge **191** on imaging unit **192**.

Imaging unit **192** is removably mounted within imaging device **102** and includes a developer unit **194** that houses a developer roll, a toner sump and a toner delivery system and a photoconductor unit (PC unit) **195**. The toner delivery system includes a toner adder roll that provides toner from the toner sump to the developer roll. A doctor blade provides a metered uniform layer of toner on the surface of the developer roll. PC unit **195** houses a photoconductive drum (PC drum) and may also include a waste toner removal system. Because imaging unit **192** is designed to carry both the developer unit **194** and the PC unit **195** it may also be referred to as an imaging basket **192**. An exit port on toner cartridge **191** communicates with an entrance port on developer unit **194** allowing toner to be periodically transferred from toner cartridge **191** to resupply the toner sump in developer unit **194**. The toner cartridge **191**, imaging unit **192**, developer unit **194** and PC unit **195** may be replaceable items for imaging device **102**. Imaging unit **192** and toner cartridge **191** may each have a memory device **196** mounted thereon for providing component authentication and information such as type of unit, capacity, toner type, toner loading, pages printed, etc. Memory device **196** is illustrated as being in operative communication with controller **103** via communication link **143**.

Controller **103** is also illustrated as being in communication, via communication link **143**, with a controller **118** in option assembly **109**. A controller **118** is typically provided within each option assembly **109** that is attached to imaging device **102**. Controller **118** operates various motors housed within option assembly **109** that position media for feeding, feed media from media path branches PB into media path P or media path extensions PX, as well as, feed media along media path extensions PX. Controllers **103**, **118** control the feeding of media along media path P and control the travel of media along media path P and media path extensions PX.

The electrophotographic imaging process is well known in the art and, therefore, will be only briefly described. During an imaging operation, laser scan unit **190** creates a latent image by discharging portions of the charged surface of the PC drum in PC unit **195**. Toner is transferred from the toner sump in developer unit **194** to the latent image on the photoconductive drum by the developer roll to create a toned image. The toned image is then transferred either directly to a media sheet received in imaging unit **192** from one of media input trays **121** or to an intermediate transfer member and then to a media sheet. Next, the toned image is fused to the media sheet in fuser **193** and sent to an output location **133** or a duplexer **130**. One or more gates **134**, illustrated as being in operative communication with controller **103** via communication link **143**, are used to direct the media sheet to output location **133** or to duplexer **134**. Toner remnants are removed from the PC drum by the waste toner removal system that may be housed within PC unit **195**. As toner is depleted from developer unit **194**, toner is transferred from toner cartridge **191** into developer unit **194**. Controller **103** coordinates these activities including media movement occurring during the imaging process or during finishing. For an imaging device **102** providing color images, four printer cartridges, one each for black, yellow, cyan, and magenta toners, would be used in imaging device **102** along with a corresponding plurality of developer and PC units.

Imaging device **102** and option assembly **109** each also include a media feed system **120** having a removable media input tray **121** for holding media M to be printed or scanned, a pick mechanism **122**, a drive mechanism **123** positioned adjacent removable media input trays **121**. Each media tray **121** also has a media dam assembly **124** and a feed roll assembly **125**. In imaging device **102**, pick mechanism **122** is mechanically coupled to drive mechanism **123** that is controlled by controller **103** via communication link **143**. In option assembly **109**, pick mechanism **122** is mechanically coupled to drive mechanism **123** that is controlled by controller **103** via controller **118** and communication link **143**. In both imaging device **102** and option assembly **109**, pick mechanisms **122** are illustrated in a position to drive a topmost media sheet from the media stack M into media dam **124** which directs the picked sheet into media path P or extension PX. Bottom feed media trays may also be used. As is known, media dam **124** may or may not contain one or more separator rolls and/or separator strips used to prevent shingled feeding of media from media stack M. Feed roll assemblies **125**, comprised of two opposed rolls—a driven roll under control of controllers **103** and/or **118** and an idler roll, feed media from an inferior unit to a superior unit via a slot provided therein.

In imaging device **102**, a media path P (shown in dashed line) is provided from removable media input tray **121** extending through print engine **104** to output area **133**. An exit feed roll pair **135** driven by motor **136** that is in operative communication with controller **103** via communication link **143** may be provided to feed the media into output area **133**. Media path P may also have extensions PX (shown in dashed line) and/or branches PB (shown in dotted line) from or to other removable media input trays as described herein such as those shown in option assembly **109**. Media path P may include a multipurpose input tray **126** provided on the housing of imaging device **102** or may be incorporated into removable media tray **121** provided in imaging device **102** and a corresponding path branch PB that merges with the media path P within imaging device **102**. Along media path P and its extensions PX are provided media position sensors **180-182** which are used to detect the position of the media, usually the leading and trailing edges of the media, as it moves along the media path P or path extension PX. Media position sensor **180** is located adjacent print engine **104** while media position sensors **181**, **182** are positioned downstream from their respective media tray **121** along media path P or path extension PX. Media position sensor **180** also accommodates media fed along path branch PB from multipurpose media tray **126**. Media position sensor **182** is illustrated at a position on path extension PX downstream of media tray **121** in option assembly **109**. Additional media position sensors may be located throughout media path P and duplex path **131**, when provided, and their positioning is a matter of design choice. Media position sensors **180-182** may be an optical interrupter or a limit switch or other type of edge detector as is known to a person of skill in the art and detect the leading and trailing edges of each sheet of media as it travels along the media path P, path branch PB, or path extension PX.

Media size sensors **183** are provided in image forming device **102** and each option assembly **109** to sense the size of media being fed from the removable media input trays **121**. To determine media sizes such as Letter, A4, A6, Legal, etc., media size sensors **183** detect the location of adjustable trailing edge media supports and one or both adjustable media side edge media supports provided within removable media input trays **121** as is known in the art. Sensors **180-183** are shown in communication with controller **103** via communication link **144**.

Separator **200** is mounted to the frame **160** of imaging device **102** and, as later explained in more detail, is used to move one of the developer unit **194** and the PC unit **195** between an operative or engaged position where the developer roll and PC drum form a contact nip along their respective axial lengths and a separated or lifted position where the developer roll and PC drum are spaced apart along at least of portion of their respective axial lengths.

Referring to FIGS. **2-5**, separator **200** is shown mounted to frame **160**. In FIG. **2**, frame **160** consists of four panels **161-164**, designated for purposes of description and not limitation as opposed first and second panels **161**, **162**, and also referred to as, front and rear panels **161**, **162**, respectively, and opposed third and fourth panels **163**, **164**, also referred to as side panels **163**, **164** or right and left side panels **163**, **164**, respectively. The opposed front and rear panels **161**, **162** and left and right side panels **163**, **164** form an opening **165** into which imaging unit **192** will be slidably inserted on rails **166** provided on front and rear panels **161**, **162**. Portions of separator **200** can be seen mounted to rear panel **162**. Those portions include a release arm **230** and base link **220** mounted to rear panel **162** and first and second lift rails **260**, **270** slidably mounted to right and left side panel **163**, **164** (see FIG. **3**). The other portions of separator **200** are obscured by the structure of the frame **160**.

In FIG. **3** imaging unit **192** has been inserted into opening **165** between front and rear panels **161**, **162**. Four developer units **194-1-194-4**, from front to rear and their corresponding PC units **195-1-195-4**, as better seen in FIG. **5**, are present in imaging unit **192**. For the illustrated arrangement, during shipment of imaging device **102**, separator **200** would be used to move and retain the developer units **194-1-194-4** in a separated position with respect to their corresponding PC units **195-1-195-4**. In FIG. **4**, an access door **170**, shown in a partially open position, spans opening **165**. As will be described, a feature provided on access door **170** is used for operation of separator **200** and engages with release arm **230**. As further explained with reference to FIGS. **15-17**, access door **170** is used to release separator **200** from an engaged position where developer units **194-1-194-4** are in their sepa-

rated positions to a released position where developer units **194-1-194-4** move into their operative position against their corresponding PC units **195-1-195-4** forming contact nips.

Referring to FIG. **5**, front and rear panels **161**, **162** and a portion of right panel **163** have been removed to illustrate the arrangement of the elements of the separator **200** with respect to the imaging unit **192**. In FIG. **5**, developer units **194-1-194-4** are shown in their operative or engaged position with their corresponding PC units **195-1-195-4**, respectively. Separator **200** is shown in a released position. Separator **200** and its components are shown in more detail in FIG. **9-11**. When the developer units are separated from their corresponding PC unit, separator **200** is said to be in an engaged position. First and second lift rails **260**, **270** are respectively positioned at opposite ends of developer units **194-1-194-4**, mounted on right and left panels **163**, **164**, and, are positioned substantially perpendicular to a release linkage **210** in a U-shaped arrangement. Included in release linkage **210** are a base linkage **220**, a release arm **230**, and first and second latch arms **240**, **250**. As shown in FIGS. **6-7**, release linkage **210** is mounted on the rear panel **162**.

The first and second lift rails **260**, **270** each have a plurality of lift slots **263-1** **263-4**, **273-1-273-4** that receive corresponding lift members **197-1-197-4**, **198-1-198-4** provided on the opposite ends of each of the developer units **194-1-194-4**. Lift members **198-1-198-4** and second lift rail **270** are illustrated as being at an elevation that is lower than that of lift members **197-1-197-4** and first lift rail **260** to accommodate the insertion of imaging unit **192** into opening **165** in frame **160**. Lift slots **263-1-263-4**, **273-1-274-4** are provided with camming features used to raise and lower the developer units **194-1-194-4** and better seen on FIGS. **10-11**.

Referring to FIGS. **6-7**, release linkage **210** is mounted on the interior and exterior surfaces **162-1**, **162-2** of rear panel **162**. Base link **220** is shown in a horizontal position and slidably mounted on interior surface **162-1** of rear panel **162** using a plurality of screws **211** and corresponding slots **223**. Base link **220** translates in the direction indicated by the double headed arrow A**1**. Because the first and second lift rails **260**, **270** are at different heights, a downward jog **222** is provided in base link **220** to accommodate for this height difference. Depending from base link **220** are the release arm **230**, and the first and second latch arms **240**, **250**. Release arm **230** is shown mounted to interior surface **162-1** of rear panel **162** while first and second latch arms **240**, **250** are mounted to the exterior surface **162-2** of rear panel **162**.

As shown in FIG. **6**, release arm **230** is coupled to a first end **220-1** of base link **220** that as shown is adjacent to right panel **163**. Release arm **230** has a first or bottom portion **231** and second or top portion **232** that are pivotally connected to one another. A first end **231-1** of first portion **231** is engaged with base link **220** at a screw **224** that is fastened to base link **220**. A first pivot **233** is provided between first and second ends **231-1**, **231-2** of first portion **231** on rear panel **162**. A second pivot **234** is provided adjacent to the second end **231-2** of first portion **231**. The second or top portion **232** of release arm **230** is mounted on pivot **234** at a location slightly above the first end **232-1** creating a small overlap OL between the first and second portions **231**, **232** allowing the second portion **232** to pivot or fold toward base link **220** as indicated by arrow A**2** but not pivot (to the right as viewed) beyond the illustrated extended position. An extension spring **235** (see inset in FIG. **8**) is wrapped around second pivot **234** biasing the second portion **232** to be in the extended position as shown in FIG. **6**.

As shown in FIG. **7**, first and second latch arms **240**, **250** are pivotally mounted to rear panel **163** on pivots **242**, **252**. First and second latch arms **240**, **250** are also mounted at their respective first ends **240-1**, **250-1** to base link **220** using pins **243**, **253** that extend through slots **162-3**, **162-4**, respectively, in rear panel **162** and through slots **225-1**, **225-2**, respectively, in base link **220**. At their respective second ends **240-2**, **250-2**, first and second latch arms **240**, **250** have latches portions **240-3**, **250-3** for engaging with respective first ends **260-1**, **270-1** of first and second lift rails **260**, **270** as seen in FIG. **8**. Latch portions **240-3**, **250-3**, extend through slots **162-5**, **162-6** in rear panel **162**. Latch portions **240-3**, **250-3** each have a notch **240-4**, **250-4** therein. Tabs **240-5**, **250-5** are also provided on first and second latch arms **240**, **250** between pivots **242**, **252**, and pins **243**, **253**, respectively. Tabs **240-5**, **250-5** extend through slots **162-7**, **162-8**, respectively, in rear panel **162**.

A spring **221** is attached at one end to base link **220** at tab **220-4** and at the other end to rear panel **162** at tab **162-11** as shown in FIG. **7**. Similarly, springs **241**, **251** are attached at one end to tabs **240-5**, **250-5** on first and second latch arms **240**, **250**, respectively, and at their other ends to rear panel **162** at tabs **162-9**, **162-10**, respectively. Spring **241** applies a force to first latch arm **240** biasing it toward the first lift rail **260**. Spring **251** similarly biases second latch arm **250** toward second lift rail **270**. Spring **221** applies a return force to base link **220** after it has been translated (to the left as shown in FIG. **6**) by the action of release arm **230**.

FIGS. **8-11** illustrate the components comprising separator **200**. FIGS. **8-9** in the engaged and released positions, respectively. FIGS. **10-11** illustrates a simplified form of separator **200**. To attain the engaged position with separator **200**, first and second lift rails **260**, **270** are pulled singly or jointly away from base link **220** as indicated by arrows A**3**, A**4**. Finger pulls **262**, **272** may be provided at respective second ends **260-2**, **270-2** of lift rails **260**, **270** for this purpose. Finger pulls **262**, **272** are used to place separator **200** in the engaged position prior to shipping or reshipping of imaging device **102**. When the first lift rail **260** is pulled away from base link **220**, the bias force from spring **241** pivots the first latch arm **240** about pivot **242** toward first lift rail **260** while pin **243** translates within slot **225-1** (see FIG. **6**) allowing the latch portion **240-3** to engage at notch **240-4** with a first end **260-1** of lift rail **260**. Notch **240-4** is provided in latch portion **240-3** to prevent over-pivoting of first latch arm **240** beyond the first end of first lift rail **260** and also provides an audible "click" as the first latch arm **240** snaps into engagement with first lift rail **260**. Similarly when the second lift rail **270** is pulled away from base link **220**, the bias force from spring **251** pivots the second latch arm **250** about pivot **252** toward second lift rail **270** while pin **253** translates within slot **225-2** allowing the latch portion **250-3** to engage at notch **250-4** with a first end **270-1** of lift rail **270**.

Upon removal of the pulling force on the first lift rail **260**, spring **261** provides a force to bias the first lift rail **260** against first latch arm **240**. Spring **261** is mounted between right panel **163** and in a fingered-slot **260-4** provided in first lift rail **260**. Spring **271** is mounted between left panel **164** and fingered-slot **270-4** provided in second lift rail **270** applying a force to second lift rail **270** to bias second lift rail **270** toward second latch arm **250**. One or more mounting slots **260-3** (see FIG. **10**), **270-3** are provided in first and second lift rails **260**, **270** to allow them to be slidably attached using screws **211** the right and left panels **163**, **164**, respectively.

As better seen in FIGS. **10-11**, each of first and second lift rails **260**, **270** is provided with one or more lift slots, four lift slots **260-51-260-54** and **270-51-270-54** are shown in the first and second lift rails **260**, **270**, Lift slots **260-51-260-54** receive first members **197-1-197-4** and lift slots **270-51-270-54** receive second lift members **198-1-198-4** of developer

units **194-1-194-4**. As shown lift slots **260-51-260-54** are punched through first lift rail **260** which is made of metal, while lift slots **270-51-270-54** are molded as part of second lift rail **270** which is molded from plastic. The choice of materials used for first and second lift rails is a matter of design choice and not of limitation. The features of the lift slots are detailed in FIGS. **17-20**.

Referring again to FIG. **8**, one or more spring-biased bell cranks **280**, **290** may be mounted on each of the first and second lift rails **260**, **270**, at each of the lift slots. Four bell cranks are mounted on first and second lift rails **260**, **270**, respectively, and provide a biasing force to the developer units **194-1-194-4** increasing the force on the contact nip between the developer roll and PC drum in PC units **195-1-195-4** formed when the developer units **194-1-194-4** and PC units **195-1-195-4** are in their respective operative positions. As shown bell cranks **280-1-280-4** are pivotally mounted on lift rail **260** adjacent to lift slots **260-51-260-54**, respectively, and bell cranks **290-1-290-4** are pivotally mounted on second lift rail **270** adjacent to lift slots **270-51-270-54**, respectively. Each of bell cranks **280-1-280-4** has a crank arm **281** and a bias spring **282** mounted on a pivot **283**. Bell crank arm **281** has an opening **283** which receives a lift member, e.g. lift member **197-1** on developer unit **197**. Bell cranks **290-1-290-4** have a different configuration. As shown in the inset, each has a crank arm **291** and a bias spring **292** mounted on a pivot **293**. Here a free end of crank arm **291** applies the biasing force to lift members **198-1-198-4** indicated by the dotted circle. As shown in FIG. **10**, bell cranks **280-1-280-4** and **290-1-290-4** are not required for the operation of separator **200** and are provided as a matter of design choice and not of limitation.

In FIG. **9**, separator **200** is shown in the released position. Release arm **230** has been pulled to the left and base link **220** translated to the right as viewed in FIG. **9**, pivoting first and second latch arms **240**, **250** away from first and second lift rails **260**, **270** allowing first and second lift rails to translate toward the base link **210** and rear panel **162**. Because of springs **241**, **251**, latch portions **240-3**, **250-3** of first and second latch arms **240**, **250**, respectively, are biased against the sides of first and second lift rails **260**, **270**.

Referring now to FIGS. **12-17** schematically show the operation of separator **200** when used in imaging unit **192** having developer units **194-1-194-4** and PC units **195-1-195-4** therein. With separator **200** in the engaged position shown in FIG. **8**, the developer rolls **194-31-194-34** of developer units **194-1-194-4** would be separated from the corresponding PC drums **195-31-195-34** of PC units **195-1-195-4** when imaging unit **192** is installed in frame **160** as shown in FIGS. **12** and **14**. As can been seen in FIG. **12**, the lift members **197-1-197-4** of developer units **194-1-194-4** are positioned within a higher portion of respective lift slots **260-51-260-54** of first lift rail **260**. With separator **200** in the released position shown in FIG. **9**, the developer rolls **194-31-194-34** would be in the operative position and contacting the corresponding PC drums **195-31-195-34** along their respective axial lengths forming a contact nip, designated CN, as shown in FIGS. **13** and **15**. As can been seen in FIG. **13**, the lift members **197-1-197-4** of developer units **194-1-194-4** have translated to a lower portion of respective lift slots **260-51-260-54** of first lift rail **260**.

As previously described, each of lift rails **260**, **270** may be independently pulled away from first and second latch arms **240**, **250** respectively, resulting in one end of the developer unit between separated from its corresponding PC unit. FIG. **16** illustrates the separation between developer rolls **194-31-194-34** and PC drums **195-31-195-34** when first latch arm **240** is engaged with the first end **260-1** of first lift rail **260** while second latch arm **250** is not engaged with the first end **270-1** of second lift rail **270**. As can be seen developer rolls **194-31-194-34** and PC drums **195-31-195-34** are separated along a substantial portion of their axial lengths except for a short portion adjacent to second lift rail **270**. FIG. **17** illustrates the separation between developer rolls **194-31-194-34** and PC drums **195-31-195-34** when first latch arm **240** is not engaged with the first end **260-1** of first lift rail **260** while second latch arm **250** is engaged with the first end **270-1** of second lift rail **270**. Similarly, developer rolls **194-31-194-34** and PC drums **195-31-195-34** are separated along a substantial portion of their axial lengths except for a short portion adjacent to first lift rail **260**. Such alternate engagement/disengagement of first and second latch arms **240**, **250** may be used where imaging device is being reshipped. Alternatively only one lift rail and latch arm may be provided in separator **200** so that developer rolls **194-31-194-34** and PC drums **195-31-195-34** are separated along the majority of their respective axial lengths.

As described, separator **200** in the engaged position separates the developer unit from the PC unit and in the released condition moves the two units in contact with one another along their respective developer rolls and PC drums. Lift slots **260-51-260-54** and **270-51-54** provide this function. Referring to FIGS. **18-21** operation of the lifts slot is shown for generic components where separation is desired for the reasons previously stated. Lift slot S is a generalized lift slot that is illustrative of lift slots **260-51-260-54** and **270-51-270-54**. Lift rail LR represents lift rail **260** or lift rail **270**. Frame panel FP represents that portion of the frame toward which lift rail LR is biased by the biasing force Fb provided by the lift rail biasing spring, such as spring **261** or spring **271**, while force Fs represents the force needed to overcome force Fb and slide or translate lift rail LR away from frame panel FP to allow latch L to be engaged between frame panel FP and lift rail LR. Latch L represents the latch portion of a latch arm, such as first or second latch arms, **240**, **250**. Lift member LM represents the lift member or members, such as lift members **197-11**, **198-11**, provided on the developer unit or on a PC unit. As shown, the bottom B, of slot S has first and second portions P**1**, P**2** interconnected by a camming surface CS. Second portion P**2** of bottom B is illustrated as being vertically offset from the first portion P**1**.

FIG. **18** schematically depicts separator **200** in an engaged position lifting an upper housing H**1** having a first member M**1**, illustrated as a roll, away from a lower housing H**2** have a second member M**2**, illustrated as a flat plate. Housing H**1** and member M**1** may represent a developer unit while housing H**2** and member M**2** may represent a PC unit or a belt. First and second members M**1**, M**2** need not be rolls. For example, first member M**1** may be a roll while second member M**2** may be a belt or plate. Lift member LM is on second portion P**2** of the bottom B of lift slot S. Viewing FIG. **19**, separator **200** is in the released position and latch L has been removed from between lift rail LR and frame panel FP. Lift member LM has transitioned down camming surface CS and is on or adjacent to first portion P**1** of the bottom of lift slot S as indicated by the solid and dashed line versions of lift member LM. It will be recognized that whether or not lift member rests on first portion P**1** of the bottom B depends on the type and force of contact between members M**1** and M**2**, their respective dimensions as compared to the height difference between first and second portions P**1**, P**2** of lift slot S.

In FIGS. **20** and **21**, elements carry the same reference designations as those used in FIGS. **18** and **19**. However in FIG. **20**, separator **200** in the released state now raises the

lower housing H2 and member M2 into contact with member M1 on housing H1. There lift member LM is on the second portion P2 of the bottom B of slot S when separator **200** is in the released position instead of the engaged position. In FIG. **21**, separator **200** is shown in the engaged position with latch L now positioned between lift rail LR and frame panel FP. Lift member LM has transitioned down camming surface CS, and, is on or may be adjacent to first portion P1 of the bottom of lift slot S. Thus separator **200** may be used on either housing H1 or H2.

Referring now to FIGS. **22-24**, actuation of separator **200** will be described. In FIG. **22**, separator **200** has been placed in the engaged position by sliding one or both lift rails away from base link **220** or rear panel **162**. This is the state used for shipping or reshipping of imaging device **102**. The second portion **232** of release arm **230** is shown folding due to the contact with actuation member **171** mounted on access door **170** as access door **170** is moved to a closed position on frame **160**. This folding action of release arm **230** allows separator **200** to remain in the engaged position. In FIG. **23**, access door **170** has reached its closed position and actuation member **171** is in a position behind the upper portion **232** of release arm **230**. The separator **200** remains in the engaged position and base link **220** has not moved. The second portion **232** of release arm **230** has returned to its extended position due to the action of spring **235**. In FIG. **24**, access door **170** is shown in the open position. Actuation member **171** has engaged the second portion **232** of release arm **30** causing it to pivot around pivot **242**. First end **231** pushes against screw **224** mounted in base link **220**, translating base link **220** toward to the left as shown, which causes first and second latch arms to pivot away from first and second lift rails **260**, **270**, placing separator in the release state as shown in FIG. **9** and the developer units **194-1-194-4** and PC units **195-1-195-4** into their operative positions. Subsequent closing and opening of access door **170** does not return separator **200** to the engaged position. To return separator **200** to the engaged position one or both lift rails need to be pulled away from rear panel **162** as previously described. Because separator **200** is installed in imaging device **102** and may be reset when needed, the drawbacks of the prior art are avoided.

The foregoing description of embodiments has been presented for purposes of illustration. It is not intended to be exhaustive or to limit the present disclosure to the precise steps and/or forms disclosed, and obviously many modifications and variations are possible in light of the above teaching. It is intended that the scope of the invention be defined by the claims appended hereto.

What is claimed is:

1. An electrophotographic imaging device, comprising:

a frame having an opposed first and a second panel connected with an opposed third and a fourth panel;

an access door pivotally mounted between the first and the second panels and adjacent to one of the third and the fourth panels and moveable between an open position and a closed position with respect to the frame;

an actuation member coupled to the access door;

a developer unit having a developer roll rotatably mounted therein;

a photoconductor (PC) unit having a PC drum rotatably mounted therein;

the developer unit and PC unit being insertable through the access door between the first and second panels and supported by the frame;

a first lift member mounted on an end of one of the developer unit and the PC unit; and,

a separator for moving one of the developer unit and the PC unit between an operative position at which the PC drum and the developer roll form a contact nip along their respective axial lengths, and a separated position whereat the PC drum and the developer roll are spaced apart along at least a portion of their respective axial lengths, the separator comprising:

a first lift rail slidably mounted on one of the third panel and the fourth panel and having at least one lift slot therein aligned with and receiving the first lift member therein when the one of the developer unit and the PC unit are inserted into the frame, the at least one lift slot having a bottom having a first portion and a second portion offset from one another with a camming portion therebetween;

a first lift rail spring coupled to the first lift rail and to the one of the third and the fourth panels to which the first lift rail is mounted; the first lift rail spring biasing the first lift rail into a biased position;

and,

a release linkage having:

a base link slidably attached to one of the first and second panels;

a release arm pivotally mounted to the one of the first and second panels to which the base link is attached and coupled to the base link, the release arm engageable with the actuation member;

a first latch arm pivotally mounted to the one of the first and second panels to which the base link is attached and pivotally coupled to the base link;

a first latch-arm spring coupled between the first latch arm and the one of the first and second panels to which the base link is attached for biasing the first latch arm toward the first lift rail; and,

the first latch arm having a latch portion, the latch portion engaging the first lift rail when the first lift rail is moved away from its biased position and holding the first lift rail away its biased position, wherein, when the first lift member is in one of the first and second portions of the at least one lift slot and the latch portion of the first latch arm is not engaged with the first lift rail, the one of the developer unit and the PC unit is the operative position with respect to the other of the developer unit and PC unit, and, when the first lift member is in the other of the first and second portions of the at least one lift slot and the first rail is engaged with the latch portion of the first latch arm, the one of the developer roll unit and the PC unit is in the separated position with respect to the other of the developer roll and the PC unit;

wherein, with one of the developer unit and the PC unit in the separated position, the latch portion of the first latch arm being engaged with the first lift rail and the access door in the closed position, on opening of the access door, the actuation member engages the release arm pivoting the release arm, translating the base link, pivoting the first latch arm and disengaging the latch portion of the first latch arm from the first lift rail, allowing the first lift rail to return to its biased position, moving the at least one lift slot so that the first lift member travels along the camming portion to the other of the first and second portions and moving the one of the developer unit and the PC unit into the operative position.

2. The imaging device of claim 1 further comprising:

the one of the developer unit and the PC unit having the first lift member has a second lift member mounted on an end opposite to the first lift member;

a second lift rail slidably mounted on the other of the third and the fourth panels having at least one lift slot therein aligned with and receiving the second lift member therein when the one of the developer unit and the PC unit are inserted into the frame, the at least one lift slot of the second lift rail having a bottom having a first portion and a second portion offset from one another with a camming portion therebetween;

a second lift-rail spring coupled to the second lift rail and to the other of the third and the fourth panels for biasing the second lift rail to a biased position; and,

the release linkage further comprising:

a second latch arm pivotally mountable to the one of the first and second panels to which the first latch arm is mounted and pivotally attached to the base link;

a second latch-arm spring coupled between the second latch arm and the one of the first and second panels to which the base link is attached for biasing the second latch arm toward the second lift rail; and,

the second latch arm having a latch portion engaging the second lift rail when the second lift rail is moved away its biased positioned and holding the second lift rail away from its biased position, wherein, when both the first and second lift members are both in a respective one of the first and second portions of their respective at least one lift slots and the first and second lift rails are in their respective biased positions, the one of the developer unit and the PC unit is the operative position, and, when both of the first and second lift members are in the respective other of the first and second portions of their respective at least one lift slots and the latch portions of the first and second latch arms are engaged with the first and second lift rails, respectively, and the one of the developer unit and the PC unit is in the separated position.

3. The imaging device claim 2 further comprising a first and a second spring-biased bell crank pivotally mounted on the first and the second lift rails, respectively, a respective end of the first and the second bell crank positioned adjacent to the one of the first and second portions of the at least one lift slots in the first and the second lift rails, respectively, the first and second bell cranks applying a biasing force to the first and the second lift members, respectively, to increase a contact force between the developer roll and the PC drum when the developer unit and the PC unit are in the operative position.

4. The imaging device of claim 1 wherein the developer unit comprises four developer units and the PC unit comprises four PC units, the first lift member comprises four first lift members mounted on a respective ones of the four developer units and the four PC units, and the first lift railing having the at least one lift slot comprises four lift slots, each lift slot receiving a respective one of the four first lift members.

5. The imaging device of claim 1 wherein a return spring is coupled between the base link and the one of the first and second panels to which the base link is attached for biasing the base link away from the first lift rail.

6. The imaging device of claim 1 wherein the release arm includes a first portion and a second portion, the first portion pivotally mounted to the one of the first and second panels to which the base link is attached, one end of the first portion coupled to the base link, the second portion being pivotally mounted to the other end of the first portion, an extension spring coupled to the first and second portions to bias the second portion to an extended position, wherein the second portion is engageable with the actuation member and moves to a folded position when the actuation member encounters the release arm on the closing of the access door so that the base link remains in place and then returns to the extended position when the access door has reach a closed position, and, upon opening of the access door, the actuation member engages the release arm, pivoting the release arm, translating the base link thereby releasing the latch portion of the first latch arm from engagement with the first lift rail allowing the first lift rail to return to its biased position.

7. The imaging device of claim 1 wherein the first lift rail has a pull thereon for translating the first lift rail away from its biased position and allowing the latch portion of the first latch arm to reengage with the first lift rail thereby separating the developer roll and the PC drum along a portion of their respective axial lengths.

8. An electrophotographic imaging device, comprising:

A frame having a rear panel, a front panel, a left and a right panel;

an access door mounted between the front and rear panel, the access door pivotally mounted and moveable between an open position and a closed position with respect to the frame, the access door having an actuation post mounted thereon adjacent to the rear panel;

an imaging unit slidably insertable through the access door and supported by the front and rear panels, the imaging unit holding at least one PC unit having a PC drum rotatably mounted therein and at least one developer unit having a left and a right lift member on respective left and right ends of the developer unit and a developer roll rotatably mounted therein, the at least one developer unit movable between an operative position where the developer roll and PC drum form a contact nip along their respective axial lengths and a separated position where the developer roll is spaced apart from the PC drum along a portion of their respective axial lengths; and,

a reusable separator for moving the at least one developer unit between the operative and separated positions, the separator comprising:

a left lift rail slidably mounted on the left panel, the left lift rail having at least one lift slot therein aligned with and receiving the left lift member therein when the imaging unit is inserted into the frame;

a right lift rail slidably mounted on the right panel, the right lift rail having at least one lift slot therein aligned with and receiving the right lift member therein when the imaging unit is inserted into the frame;

a left and a right lift-rail spring between the left and the right lift rails and the left and the right panels, respectively, for biasing the left and the right lift rails to respective biased positions adjacent to the rear panel;

each at least one lift slot in the left and the right lift rails having a bottom having a first portion and a second portion vertically offset from one another with a camming portion therebetween; each at least one lift slot sized to receive the corresponding lift member; and,

a release linkage having:

a base link slidably attached to the rear panel;

a release arm pivotally mounted to the rear panel and pivotally attached to the base member, the release arm engageable with the actuation post;

a left and a right latch arm pivotally each pivotally mounted to the frame adjacent to the left and right lift rails, respectively, the left and the right latch arms each pivotally attached to the base link;

a left and a right latch-arm spring coupled between the left and the right latch arms, respectively, and the rear panel for biasing the left and the right latch arms toward the left and the right lift rails, respectively; and,

each latch arm having a latch portion engaging the respective lift rail when the respective lift rail is moved away its biased position and holding the respective lift rail away from its biased position, wherein, when the left and the right lift members are both in one of the first and the second portions of their respective lift slots and the left and the right lift rails in their respective biased positions, the developer unit is the operative position, and, when the left and the right lift members are both in the other of the first and the second portions of their respective lift slots and the left and the right latch arms are engaged with the left and the right lift rails, respectively, and the developer unit is in the separated position;

wherein with the at least one developer unit in the separated position and the left and the right latch arms engaged with the left and the right lift rails, respectively, and the access door in the closed position, on opening of the access door, the actuation post engages the release arm pivoting the release arm, translating the base link, pivoting the left and the right latch arms and disengaging them from the left and the right lift rails allowing the left and the right lift rails to return to their respective biased positions and moving the respective at least one lift slots in each of the left and the right lift rails so that the left and right lift posts travel along the respective camming portions to the other of the first and second portions moving the at least developer unit into the operative position with the at least one PC unit.

9. The imaging device of claim **8** wherein a return spring is coupled between the base member and the rear panel for biasing the left and the right latch arms toward their respective left and right lift rails.

10. The imaging device of claim **9** wherein a portion of the release arm that is engageable with the actuation post is moveable when the actuation post encounters the release arm on the closing of the access door so that the release arm does not translate the base link.

11. The imaging device of claim **10** wherein the portion of the release arm that is engageable with the actuation post moves to folded position when engaged with the actuation post on the closing of the access door and returns to an unfolded position when the access door has reach the closed position.

12. The imaging device of claim **8** wherein at least one of the left and the right lift rails has a pull thereon accessible through the front jam door, the pull translating the at least one of the left and the right lift rails away from the rear panel and allowing the latch portion of the corresponding one of the left and the right latch arms to reengage with the corresponding at least one of the left and the right lift rails to move the corresponding one of the left and the right ends of the at least one developer unit away from the PC unit separating the at least one developer roll and the at least one PC drum along a portion of their respective axial lengths.

13. The imaging device of claim **12** wherein the pull is provided on each of the left and the right lift rails.

14. The imaging device of claim **8** further comprising a left and a right spring-biased bell crank pivotally mounted on the left and the right lift rails, respectively, a respective end of the left and right bell crank positioned adjacent to the one of the first and second portions of the at least one lift slots in the left and the right lift rails, respectively, the left and right bell cranks applying a biasing force to the left and the right lift members, respectively, to increase a contact force between the at least one developer roll and the at least one PC drum when the at least one developer unit and the at least one PC unit are in the operative position.

15. The imaging device of claim **8** wherein the at least one developer unit includes four developer units and the at least one PC unit includes four PC units and the left and the right lift rails each having respective at least one lift slot includes four lift slots, respectively, for receiving the corresponding left and right lift members of the four developer units.

16. A separator for use in an electrophotographic imaging device for separating a developer roll and a photoconductive (PC) drum mounted therein when the developer roll and the PC drum are in an operative position with developer roll and the PC drum forming contact nip along their respective axial lengths and placing the developer roll and the PC drum in a separated position where the developer roll and the PC drum are spaced apart along at least a portion of their respective axial lengths, the imaging device having a frame having an opposed first and a second panel connected with an opposed third and a fourth panel, an access door pivotally mounted between the first and the second panels and adjacent to one of the third and the fourth panels and moveable being an open position and a closed position with respect to the frame, the access door having actuation member mounted thereon, the separator comprising:

a lift rail slidably mountable to one of the third and fourth panels and biased towards one of the first and second panels in a biased positioned, the lift rail having a lift slot therein, the lift slot having a bottom with a first portion and a second portion offset from one another and connected by a camming portion; the lift slot sized to receive a lift member mounted on one of the developer roll and PC drum wherein, when the lift member is in one of the first and second portions, the developer roll and the PC drum are in the operative position, and, when the lift member is in the other of the first and second portions, the developer roll and the PC drum are in the separated position; and,

a release linkage having a base link, a release arm, and a latch arm, the base member slidably attachable to one of first and second panels, the release arm pivotally mountable to the frame and pivotally attached to the base link, a latch arm pivotally mountable to the frame and pivotally attached to the base link, the latch arm biased toward the lift rail and having a latch portion engaging the lift rail when the lift rail is moved away from its biased position and holding the lift rail apart from its biased position, the release arm engageable with the actuation member wherein, with the separator installed in the imaging device with the PC drum and developer roll in the separated position, the lift member in the at least one lift slot and the access door in the closed position, on opening of the access door, the actuation member engages the release arm pivoting the release arm, translating the base link, pivoting the latch arm and disengaging the latch portion from the lift rail allowing the lift rail to return to its biased position and moving the lift member from the other of the first and second portions along the camming portion to the one of the first and second portions moving one of the developer roll and PC drum into the operative position.

17. The separator of claim **16** wherein, with the separator installed in the imaging device and the developer roll and PC

drum are in the operative position, on reclosing of the access door, the actuation member initially passes the release arm without pivoting the actuator arm, and the lift rail remains in its biased position keeping the developer roll and PC drum in the operative position, and, further wherein, on reopening of the access door, the actuation member engages the actuator arm pivoting the actuator arm, translating the base member and pivoting the latch arm without the developer roll and the PC drum going to the separated position.

18. The separator of claim **16** wherein to return the developer roll and PC drum to the separated position, a translation force is applied to the lift rail moving the lift rail away from its biased position allowing the latch arm to pivot and the latch portion to reengage with the lift rail with the lift member moving to the other of the first and second portions in the lift slot.

19. The separator of claim **16** further comprising a spring-biased bell crank pivotally mounted on the lift rail having one end positioned adjacent to the one of the first and second portions of the lift slot where the developer roll and the PC drum are in the operative position for applying a biasing force to the lift member to increase a contact force between the developer roll and the PC drum.

* * * * *